7 DECEMBER 1961

ONE SHILLING
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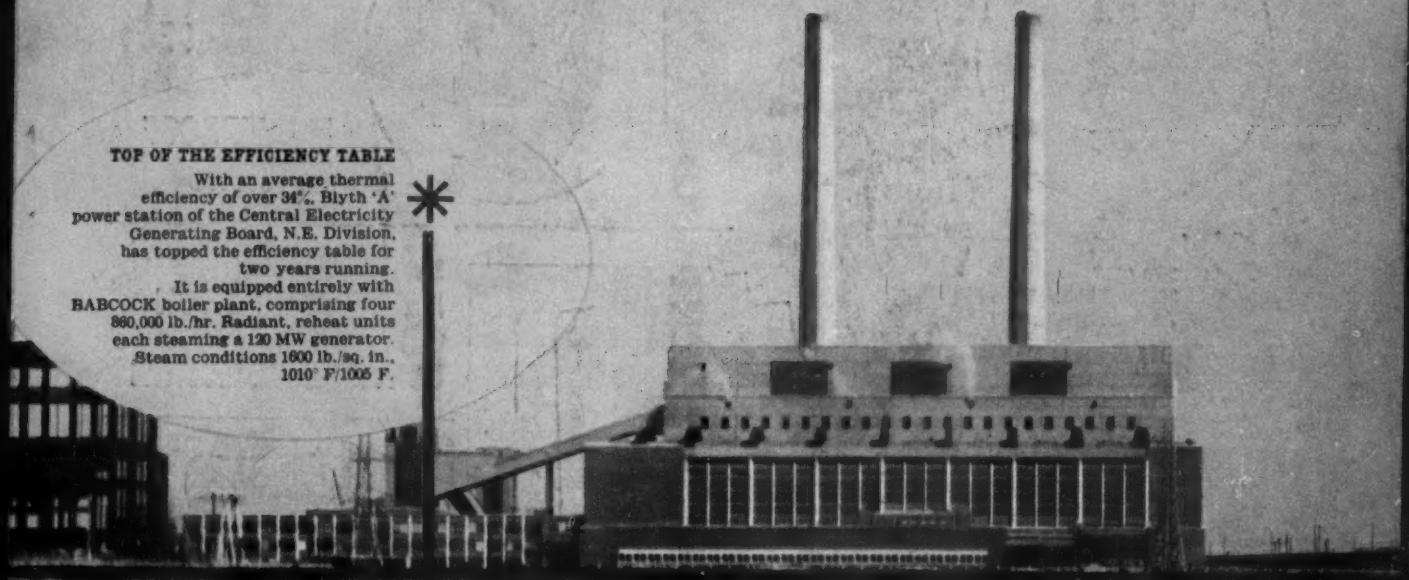
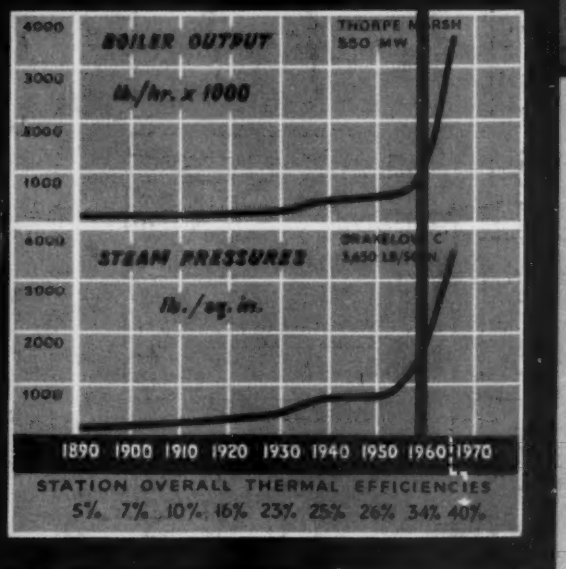
ELECTRICAL TIMES



TOP OF THE EFFICIENCY TABLE

With an average thermal efficiency of over 34%, Blyth 'A' power station of the Central Electricity Generating Board, N.E. Division, has topped the efficiency table for two years running.

It is equipped entirely with BABCOCK boiler plant, comprising four 860,000 lb./hr. Radiant, reheat units each steaming a 120 MW generator. Steam conditions 1600 lb./sq. in., 1010° F/1005 F.



The March of Steam

Progress in power generation, to the present stage of a single boiler to serve a 550 MW set or to operate at supercritical pressure, with central-station thermal efficiencies approaching 40%, has followed the path of advancing steam technology and engineering, an advance in which, for well over half a century, the BABCOCK organization has been in the lead.

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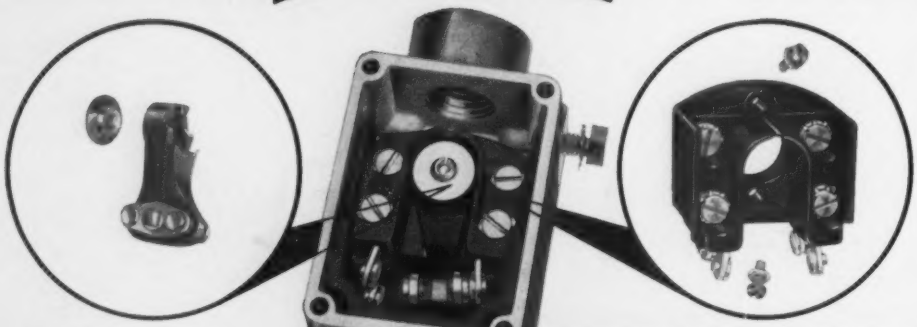
in Mark II SNAP-LOCK heavy duty limit switches



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REPLACEABLE UNITS IN THE ELECTRICAL SIDE

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Single pole, double break, double throw, operates with either circuit normally open with other closed, or maintaining in either position, or available with central (neutral) position and/or centre connection. Heavy aluminium die-cast case. Water, oil and dust proof Conduit ¾ in. B.S., or No. 3 Admiralty Pattern Cable gland entry. Two-screw side mounting or backplate mounting in two styles, or Tandem style (back to back mounting). Operating lever position adjustable in 7.5 deg. increments through 82.5 deg. either way from normal.

STANDARD NEUTRAL POSITION OR CENTRE CONNECTION

FLP FLAMEPROOF

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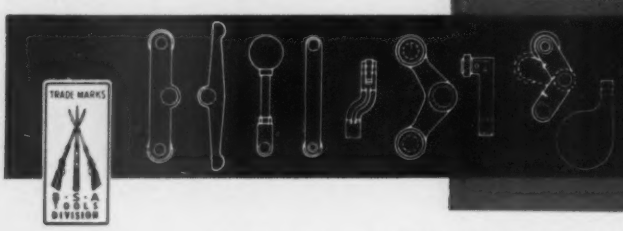

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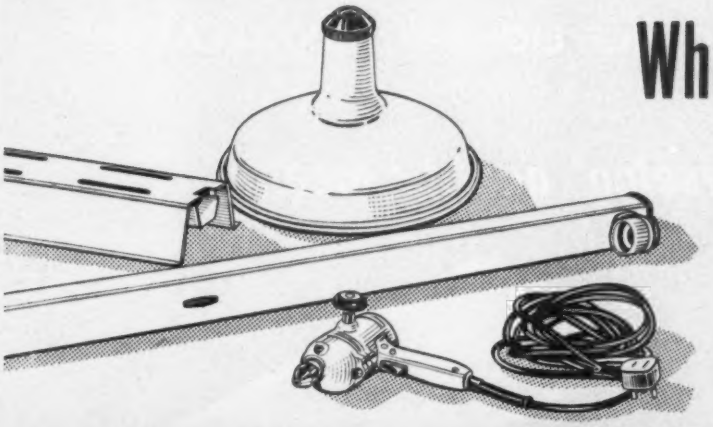

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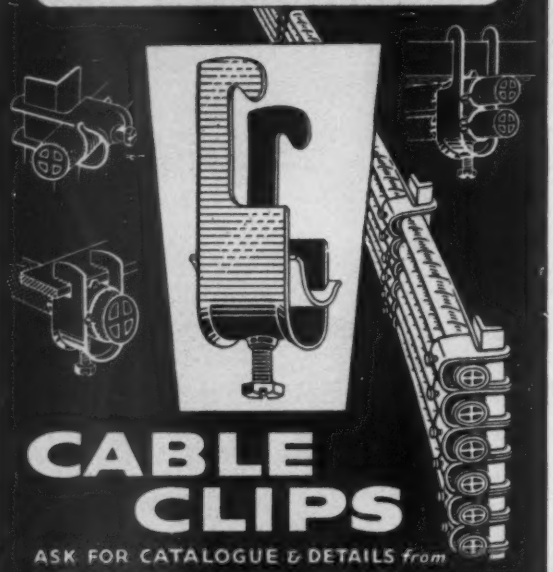

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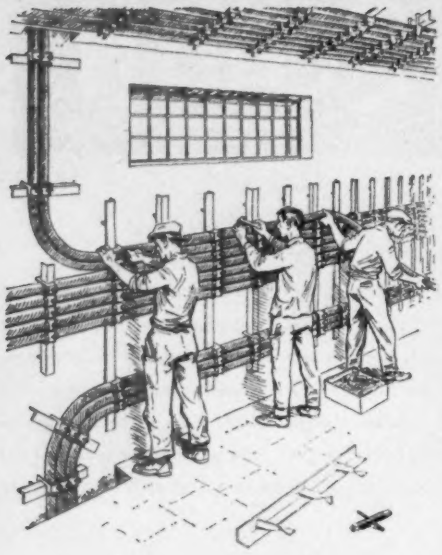

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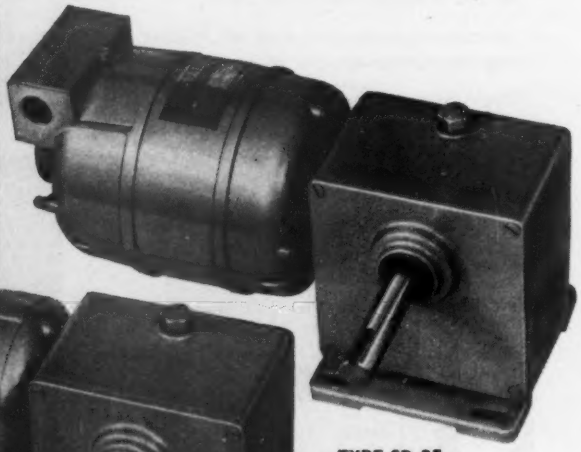

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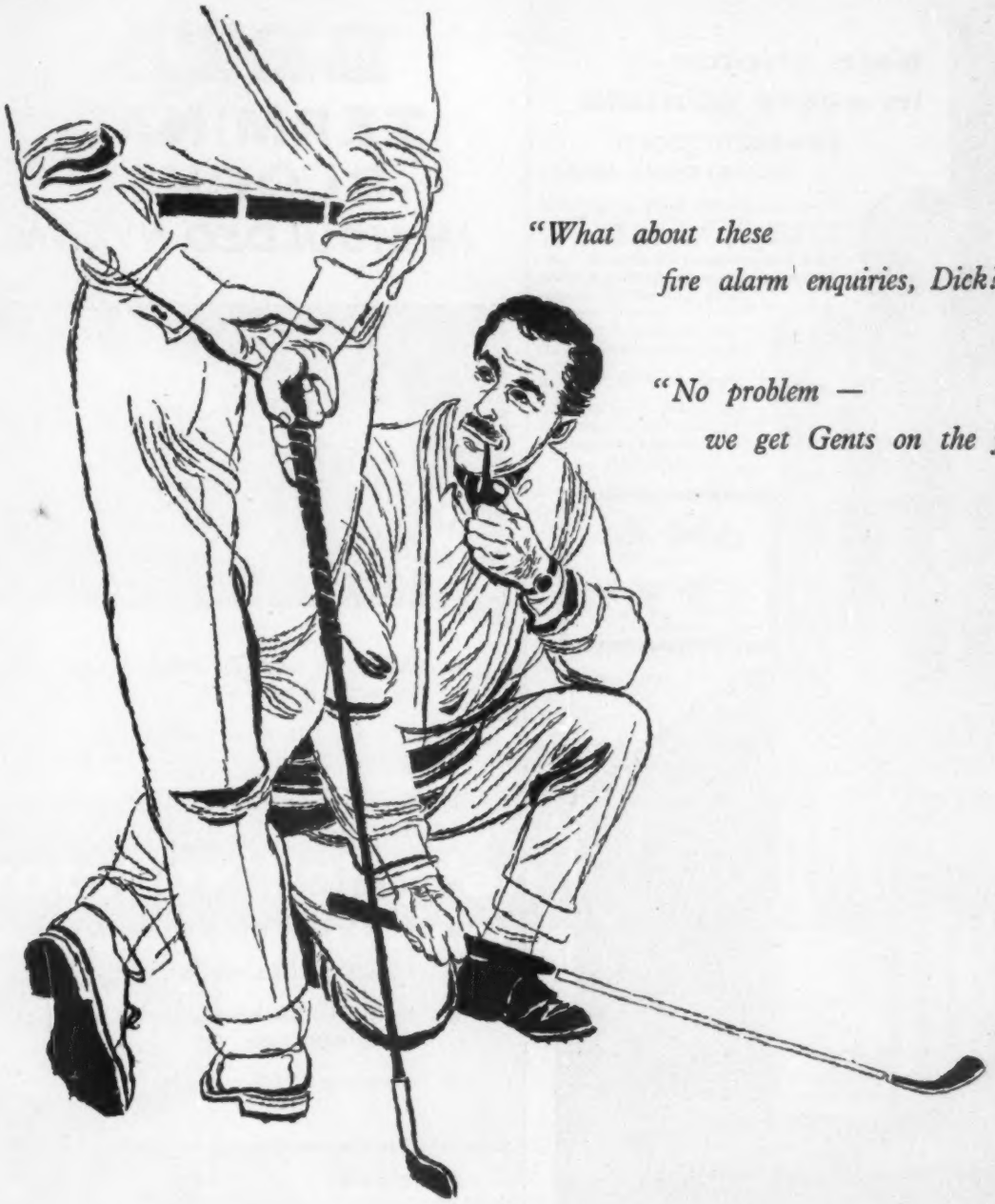

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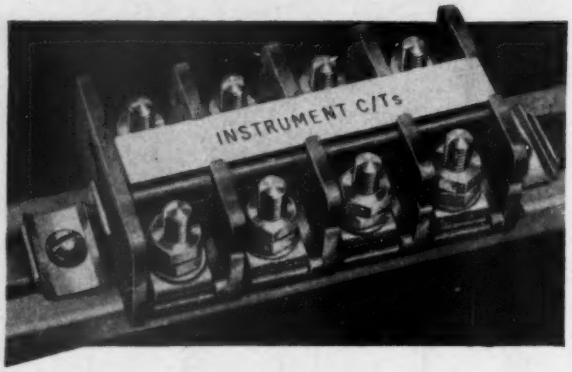

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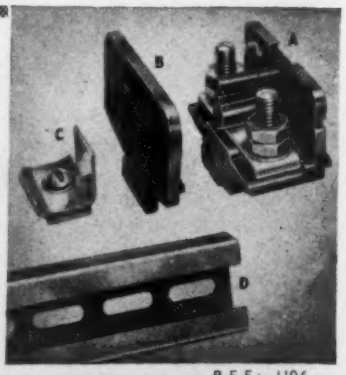

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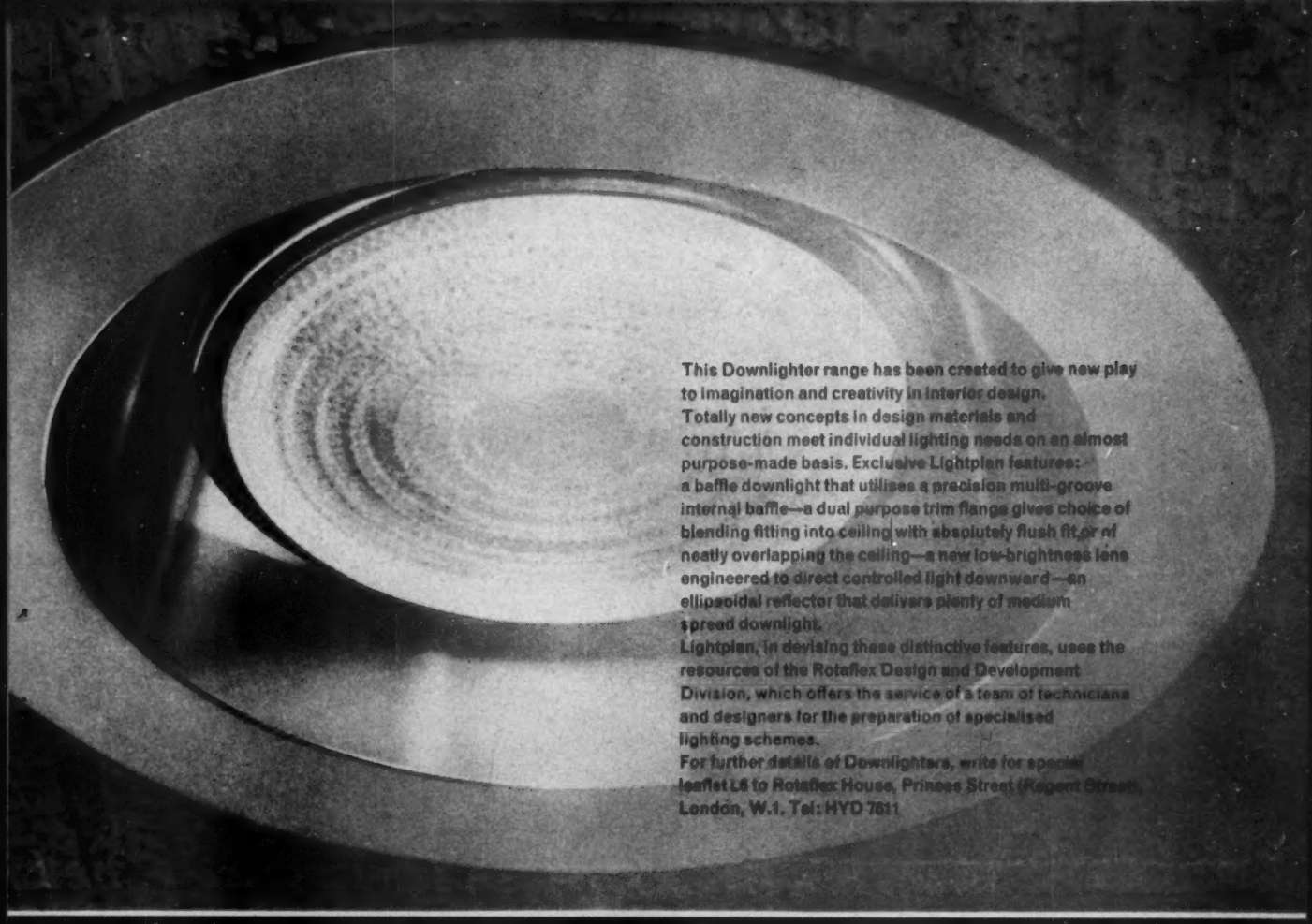
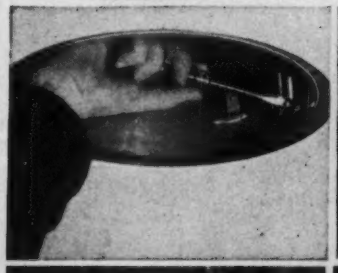
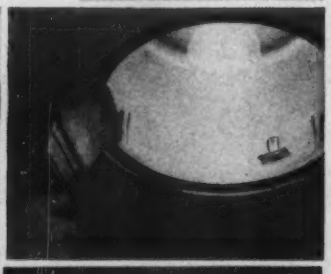
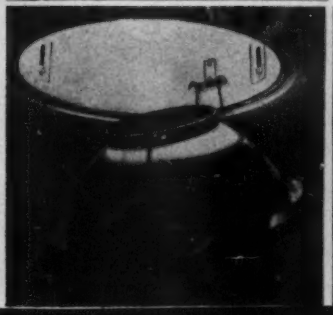


This Downlighter range has been created to give new play to imagination and creativity in interior design. Totally new concepts in design materials and construction meet individual lighting needs on an almost purpose-made basis. Exclusive Lightplan features: a baffle downlight that utilises a precision multi-groove internal baffle—a dual purpose trim flange gives choice of blending fitting into ceiling with absolutely flush fit, or of neatly overlapping the ceiling—a new low-brightness lens engineered to direct controlled light downward—an ellipsoidal reflector that delivers plenty of medium spread downlight.
Lightplan, in devising these distinctive features, uses the resources of the Rotaflex Design and Development Division, which offers the service of a team of technicians and designers for the preparation of specialised lighting schemes.
For further details of Downlighters, write for special leaflet L6 to Rotaflex House, Princes Street (Regent Street), London, W.1. Tel: HYD 7811

rotaflex lightplan downlighter



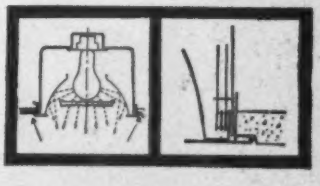




floating lens

Part of the Downlighter range: a fully-recessed lighting unit incorporating Lightplan golden floating coloured lens, recessed above the ceiling line into a highly efficient gold bright anodised reflector. The soffit ring, lens and reflector are attached to the main housing by means of torsion springs. Re-lamping requires no tools—simply pull down soffit ring and immediate access is possible—no fixing screws are visible.

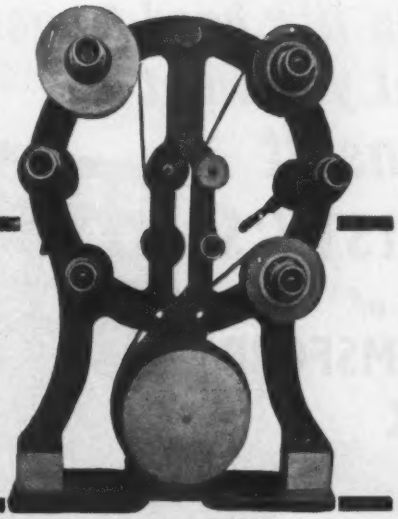
1 2
3 4
5 6



1 Dual-purpose trim flange used as a plaster ring is fixed by plaster lugs wired to metal lathing. The plaster retainers act as spacers and lock the plaster ring in position (for dry ceilings reverse dual-purpose trim flange).
2 Dual-purpose trim flange flush with ceiling line in completed plaster work. The body of the fitting is shown connected to the electrical installation ready for fixing.
3 Positive fixing for the body is provided in the dual-purpose trim flange. Slots permit accurate levelling with trim flange.
4 Fitting illuminated, painting in progress. Uninterrupted ceiling area (no cutting-round the soffit ring) ensures a fast, clean job.
5 Building work complete, soffit ring and interior of the fitting fixed with torsion springs, no tools required. Gasket provides effective light and air seal (flange and interior fitting can be installed in under five seconds with the torsion spring system).
6 High speed fixing, end of job installation, preserves clean, factory-fresh appearance.

This transformer coil costs less, weighs only half as much– it's wound with **aluminium strip**

Coils wound with aluminium strip not only have better electrical and thermal characteristics: they are simple to make and show appreciable savings in material costs. Because they have none of the air spaces unavoidable with round wire, they are generally no larger than wire-wound coils of equal power and weigh only half as much. If you would like to know more about strip windings, or other uses of aluminium in the electrical industry, get in touch with any of the Alcan Industries' offices listed below.



SIMPLE TO MAKE

The winding technique is very simple, needing no costly winding equipment with traversing gear. The coils can be wound on to their cylindrical formers without flanged bobbins. Service and advice are freely available to firms interested in strip winding techniques.

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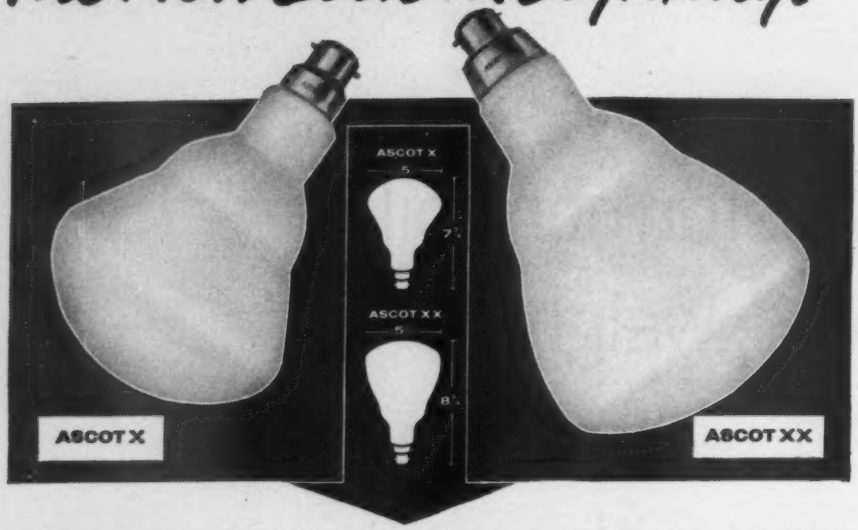

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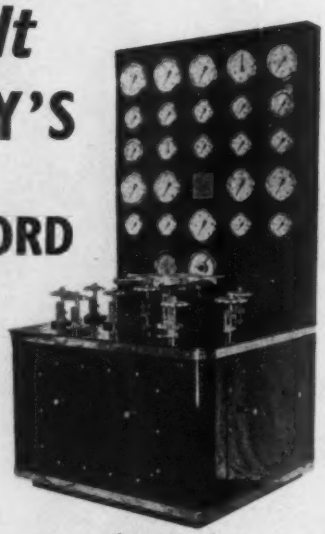

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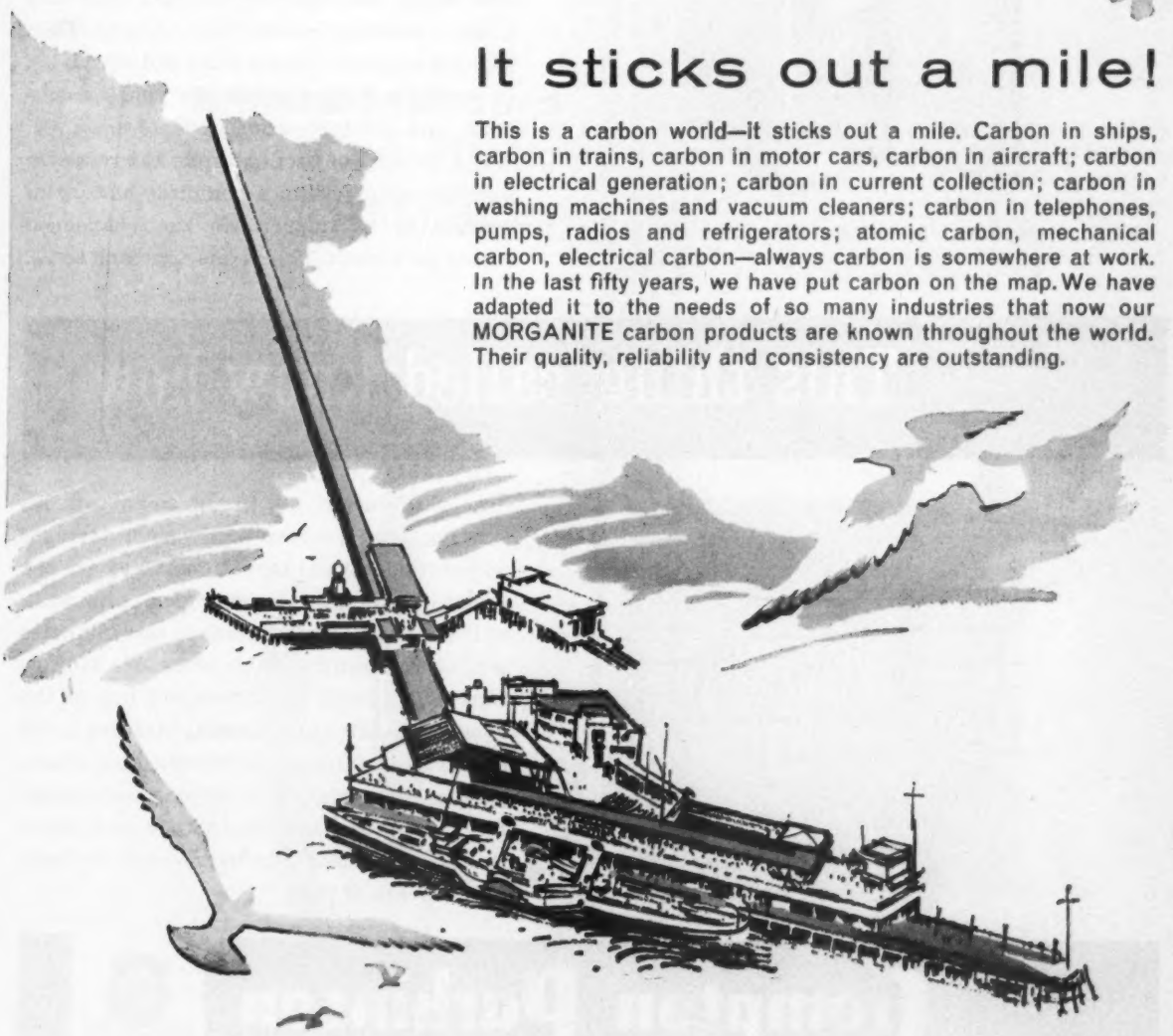

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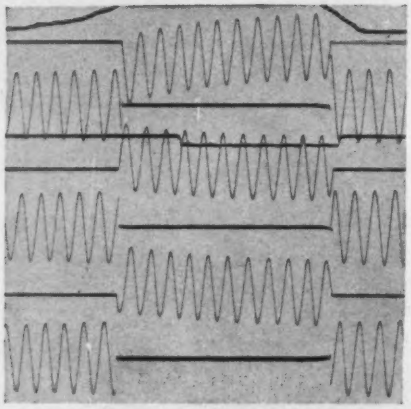
OSIA/756

Testing plays a larger part in the development of switchgear than of most plant. And it is not a matter of subjecting a circuit-breaker to a heavy overload to see whether it blows up. On the contrary, to the non-specialist observer a test is an almost ludicrous anti-climax. The build-up is impressive; long preparation, elaborate fire precautions, the switchgear itself as distant as the target in a rifle range and watched through armoured glass. A warning hooter clears the site. Then the test engineer presses a control switch . . . in complete silence absolutely nothing happens, and the test—another 'shot'—is over. But a battery of oscillographs has recorded on photographic film a complete history of everything of importance that happened inside the switch. This is one approach to . . .

This thing called know-how



Any new design or improvement of an existing one involves many such tests of numerous detailed innovations. They are the means by which the designer checks his work as it proceeds. Ready access to test facilities is thus an essential of his work. We are fortunate in having at Chelmsford one of the most up-to-date (ASTA) testing stations in the country, and this has played a most important part in the evolution of all our switchgear. But there is another side to know-how which comes from sheer experience—and we have had 80 years of that.

Crompton Parkinson LIMITED

ELECTRICAL EQUIPMENT

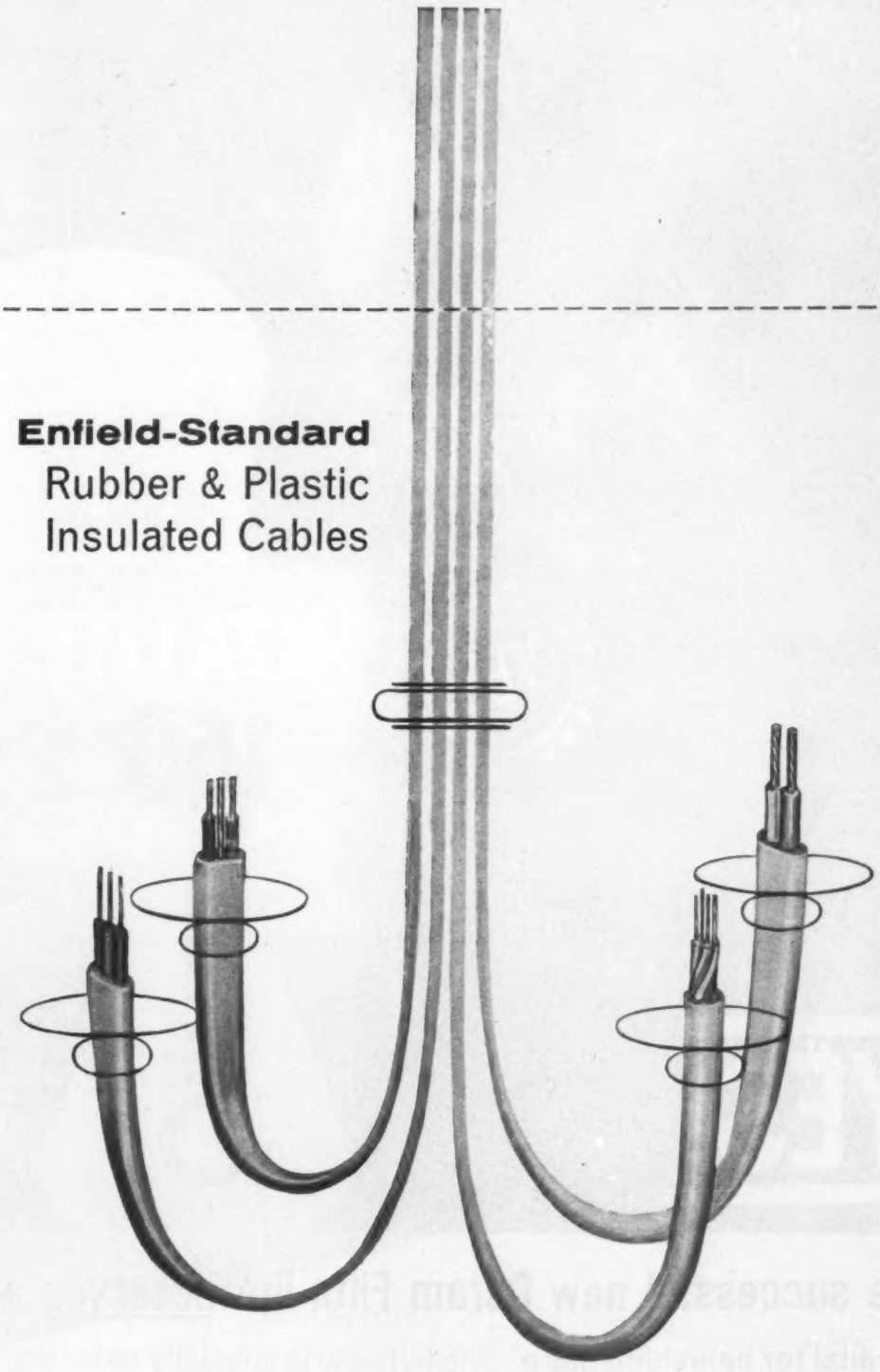
OWNERS OF AN APPROVED **ASTA** TESTING STATION

Makers of Electric Motors of all kinds, A.C. and D.C. Generators, B.E.T. Transformers, Switchgear, Cables, Instruments, Lamps, Lighting Equipment, Batteries, Stud Welding Equipment, Traction Equipment, Ceiling Fans.

CROMPTON PARKINSON LTD., CROMPTON HOUSE, ALDWYCH, LONDON, W.C.2.

5611

Enfield-Standard
Rubber & Plastic
Insulated Cables



Enfield-Standard Power Cables Limited

Head Office and Works:

BRIMSDOWN · ENFIELD · MIDDLESEX · TELEPHONE: HOWARD 2468

The successful new Osram Filta-lite deserves a medal!

A medal for banishing glare. The Filta-lite is specially coated on the inside to filter out glare and spread an even light.

A medal for brightening profits. The Filta-lite is sold in gay colour-coded sleeves for immediate wattage identification, packed in unique self-service zipper cases, and backed by nation-wide advertising on TV and in the press.

Order direct from your wholesaler or write to the Marketing Dept., Osram Lamp Division, The General Electric Co. Ltd., East Lane, Wembley, Middlesex

UNIT AND CUBICLE CONSTRUCTION SWITCHBOARDS

Illustration on right shows an indoor totally enclosed unit construction type "Y" switchboard with incoming duplicate busbars feeding common outgoing circuits by means of interlocked fused switches of both 300 amp and 500 amp capacity.

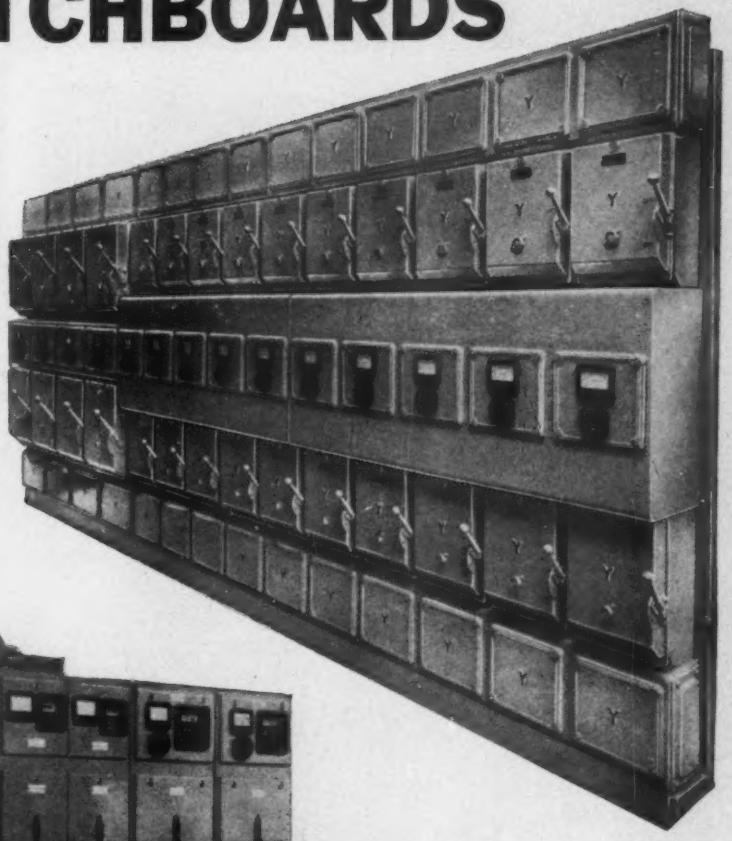
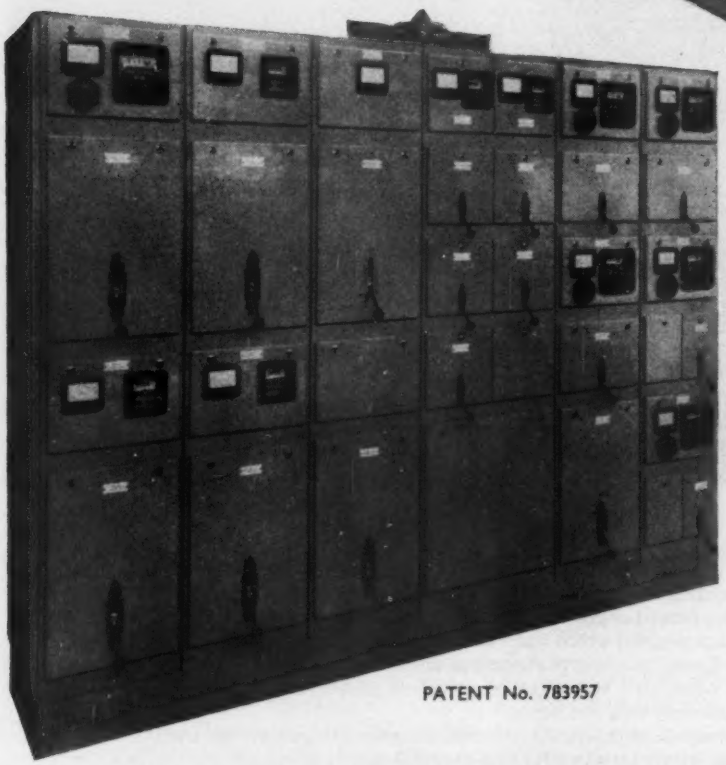


Illustration below shows an indoor all-isolating cubicle construction switchboard having individual metering on the outgoing fused switches of 60 amp, 160 amp and 300 amp capacity.



We specialise in building switchboards to your exact requirements with facilities for extension. Designed to give unfailing service under the most onerous climatic conditions whether installed indoors or out of doors.

PATENT No. 783957

ELECTRO MECHANICAL MFG. CO. LTD.

Head Office and Works: Eastfield, SCARBOROUGH

Telephone: Cayton Bay 441/2

London Office and Showroom: 133-135 Grand Buildings, Trafalgar Square, LONDON W.C.2

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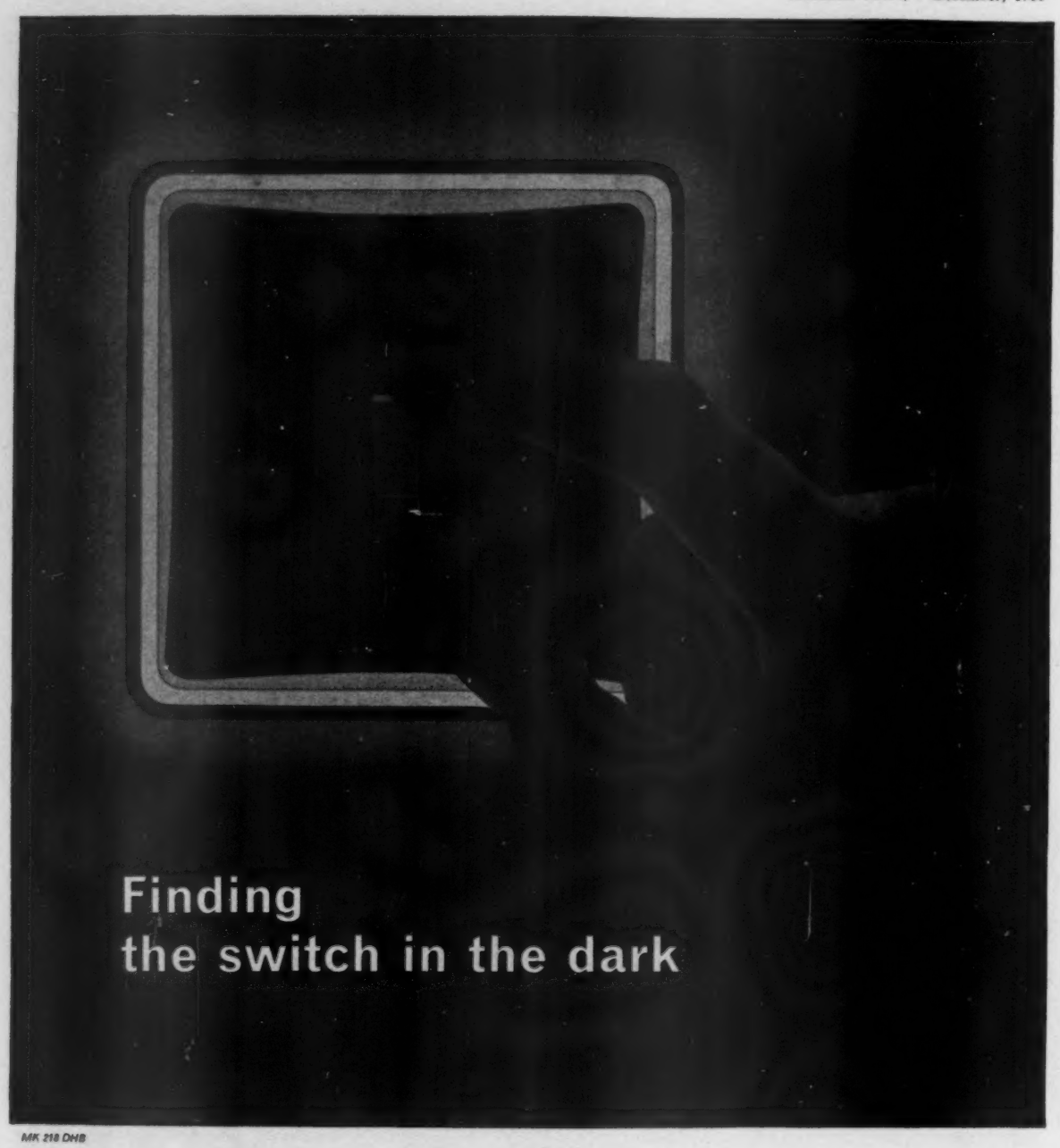
Subsidiary of Yorkshire Switchgear and Eng. Co. Limited, Leeds and London



MK 218 DHB

MK

LUMINOUS LOCATOR

Groping in the dark to find a switch or socket-outlet frequently results in clashes with furniture and also finger-soiled walls. The solution is to see them, not to 'feel' for them.
The M.K. Luminous Locator is a neat fitment which surrounds any British Standard flush switch or socket-outlet which has two fixing screws on 2¾" centres.
Emits in darkness by a practical application of 'Panelume' electroluminescence a bright glow which completely surrounds the switch or socket-outlet. Reverts in daylight to ivory colour, in harmony with any decor.
Current consumption is only 0.3 mA, and life expectancy is almost everlasting.
An essential fitment for all switches and socket-outlets which are fitted in halls, corridors, landings and bedrooms of domestic properties, and with many applications in hotels, offices, hospitals, etc.
Watch for our forthcoming announcements appearing in Ideal Home, House Beautiful, Good Housekeeping and Homes and Gardens and be ready to meet the demand!

Have you received copies of our new Leaflet 260?

M. K. ELECTRIC LIMITED, EDMONTON, LONDON N.9 TEL: EDMonton 5151

NEWS SHEET

160 MW cross-Channel d.c. link inaugurated tomorrow by Minister of Power. Link has been operating since early October. Changeover from import to export carried out by automatic sequencing equipment. Link operates at ± 100 kV d.c. and has two converter bridges in series. The two substations are at Lydd and Echinghen, near Boulogne. (836, 845)

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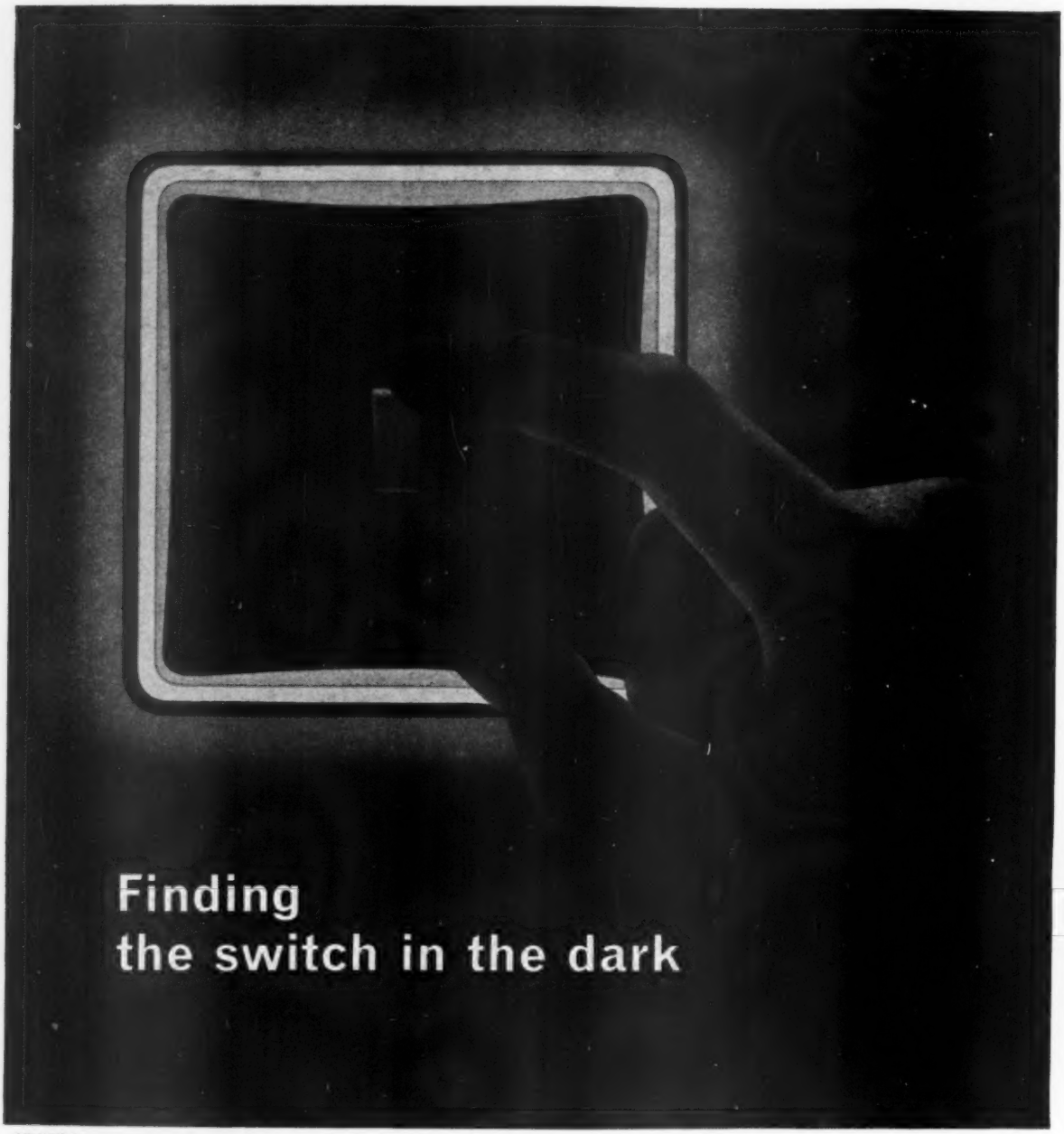

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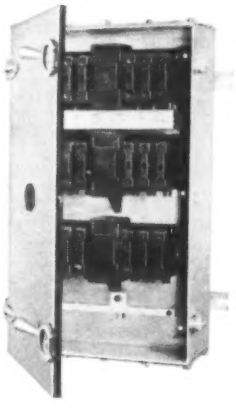
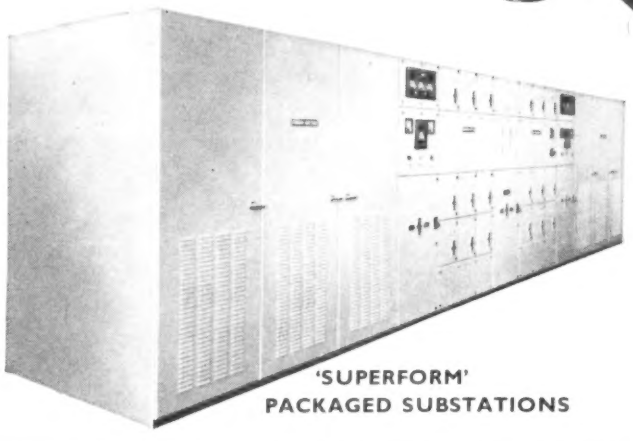
A WIDE RANGE
OF ELECTRICAL DISTRIBUTION EQUIPMENT

TYPE 'T' H.R.C. FUSE-LINKS
(35 MVA at 440 Volts A.C.)

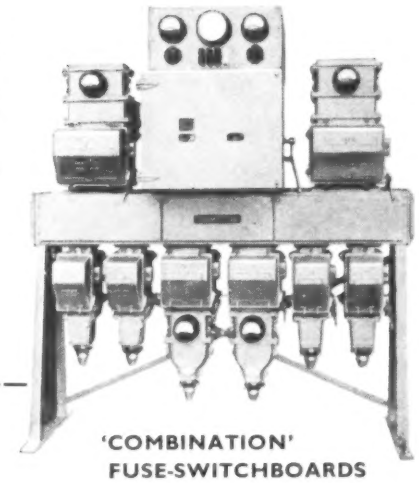
'RED SPOT'
H.R.C.
FUSE FITTINGS



'RED SPOT'
HEAVY DUTY
FUSEBOARDS



'SUPERFORM'
PACKAGED SUBSTATIONS



'COMBINATION'
FUSE-SWITCHBOARDS

'ENGLISH ELECTRIC' manufacture:

H.R.C. CARTRIDGE FUSE-LINKS
*'RED SPOT' H.R.C. FUSE FITTINGS
*'RED SPOT' FUSEBOARDS
*'SUPERFORM' SWITCHBOARDS
*'SUPERFORM' PACKAGED SUBSTATIONS
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*'COMBINATION' FUSE-SWITCHES
OVERHEAD BUSBAR SYSTEMS
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FUSEGEAR DIVISION, EAST LANCASHIRE ROAD, LIVERPOOL 10

The English Electric Company Limited, English Electric House, Strand, London, W.C.2

FG 66C

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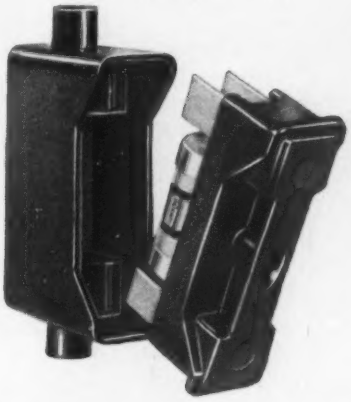

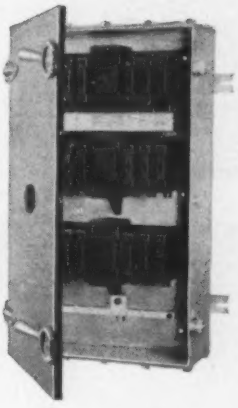

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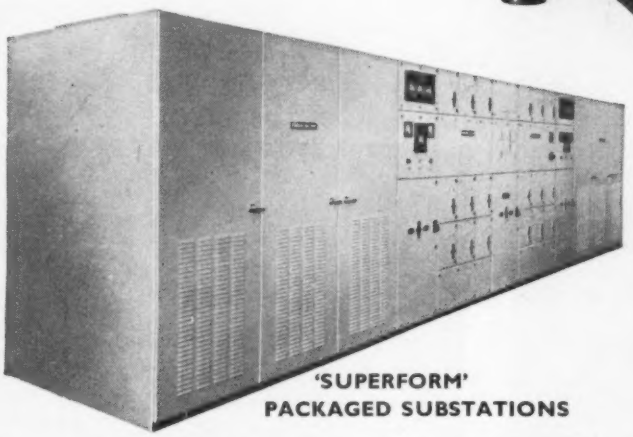

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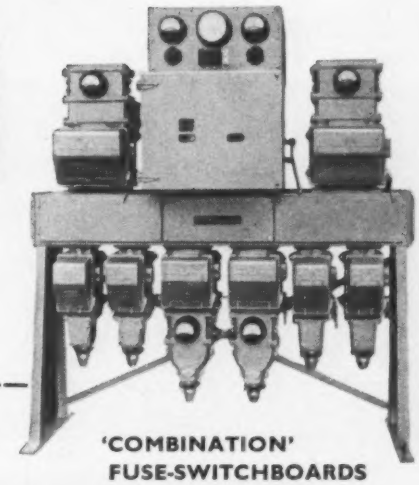

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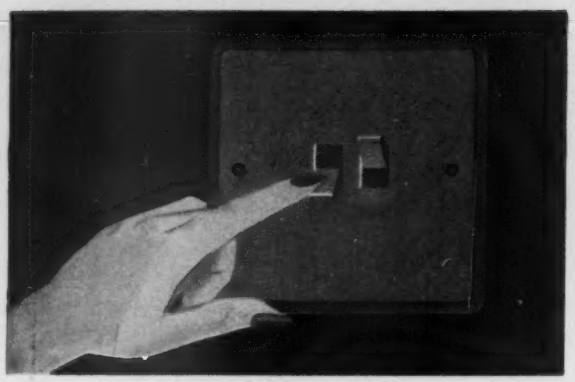
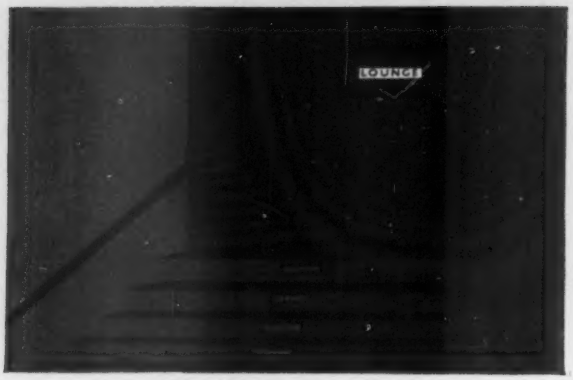
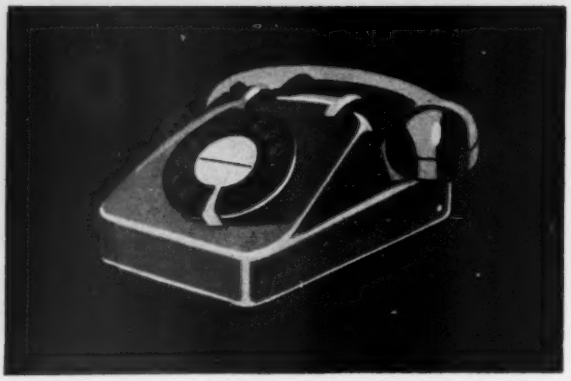






THORN PANELUME LAMPS

Thorn Electrical Industries Limited who pioneered the commercial use of electroluminescence in the form of Panelume lamps for aircraft cabin signs, are now able to offer this new light source for domestic applications.

Panelume lamps are rugged, long-life, luminous steel panels that have no filaments, no cathodes, no glass envelopes. They are particularly suitable for incorporating into products which need to be seen in the dark. Other features include:

Surface Brightness – 1 to 3 foot lamberts.

Life Expectation – 40,000 hrs. to half brightness.

Running Costs – 0.3 mA per square inch at 250V AC 50cps (less than 1d. per annum).

Panel Size – Maximum dimensions for a single panel are 10″ x 8″.

Colours Available – Blue and green.

For more information or illustrated brochure write to:

THORN ELECTRICAL INDUSTRIES LIMITED,
Special Products Division, Great Cambridge Road, Enfield, Middlesex. Enfield 5353
DTV/P

They take it for granted

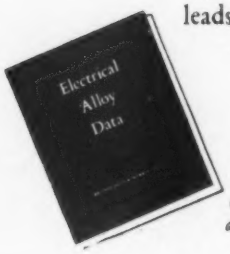
If there is one item of shopping that is nearest to a woman's heart (and logically to a man's), it is choosing a cooker. This, perhaps, gives rise to a certain conflict of loyalties. On the one hand a cooker must do an efficient job in providing for the inner man; on the other it has to be an attractive and prized piece of kitchen furniture.

Fortunately, with modern electric cookers the situation is easily reconcilable. Nevertheless, there are many pros and cons to be weighed in the balance.

One rather important component, however, is likely to be taken for granted. That is the heating element. The cooker manufacturer may rest easy in his mind about this so long as the element is wound with Nichrome* electrical resistance wire. We have been making and developing this alloy for fifty years, and we are glad to say it has the confidence of leading cooker manufacturers.

Regd. Trade Mark

NICHROME* for heating elements up to 950°C.
NICHROME*V for heating elements up to 1150°C.
BIMETAL for thermostats
DRIVEX* *CABLES* for leads



"Electrical Alloy Data" contains 84 pages of fundamental information concerning the use of electrical resistance alloys. Copies are available free of charge on request.

BRITISH DRIVER-HARRIS CO LTD

CHEADLE HEATH, STOCKPORT, CHESHIRE

NICHROME
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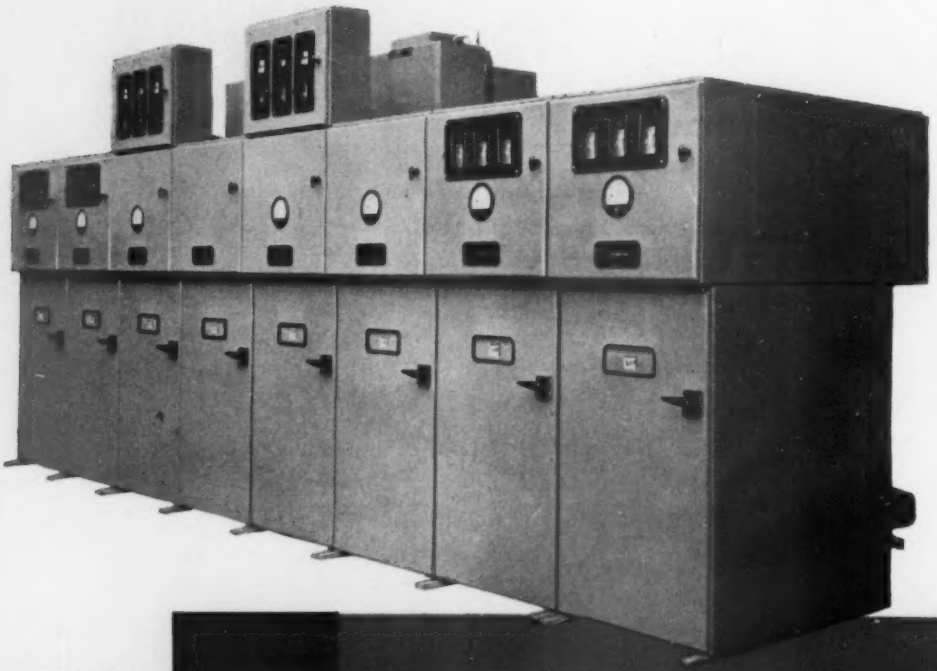
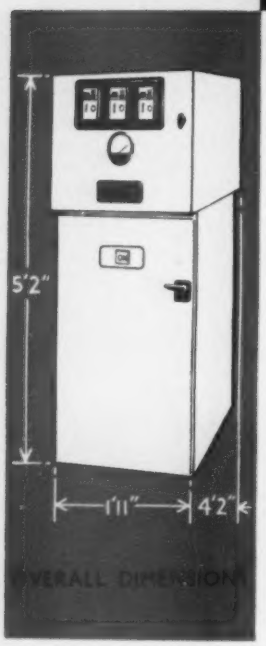


CLASS L M T OIL-BREAK SWITCHGEAR



METAL-ENCLOSED: AIR-INSULATED: VERTICALLY-ISOLATED

Current-ratings: 400, 800, and 1200 amperes

Breaking-capacity Ratings: 150 MVA at 6.6 kV
250 MVA at 11 kV

Independent-manual, spring-operated, or solenoid closing mechanism.

Integral earthing through the circuit-breaker.

Epoxy-resin insulation with PVC-sheathed busbars.

Complies fully with B.E.B.S.-S2 (1955) and Addendum (1959), and other current-transformers, instruments, and forms of protection are available.

A.S.T.A. certified.

Reyrolle

A. Reyrolle & Company Limited - Hebburn - County Durham - England

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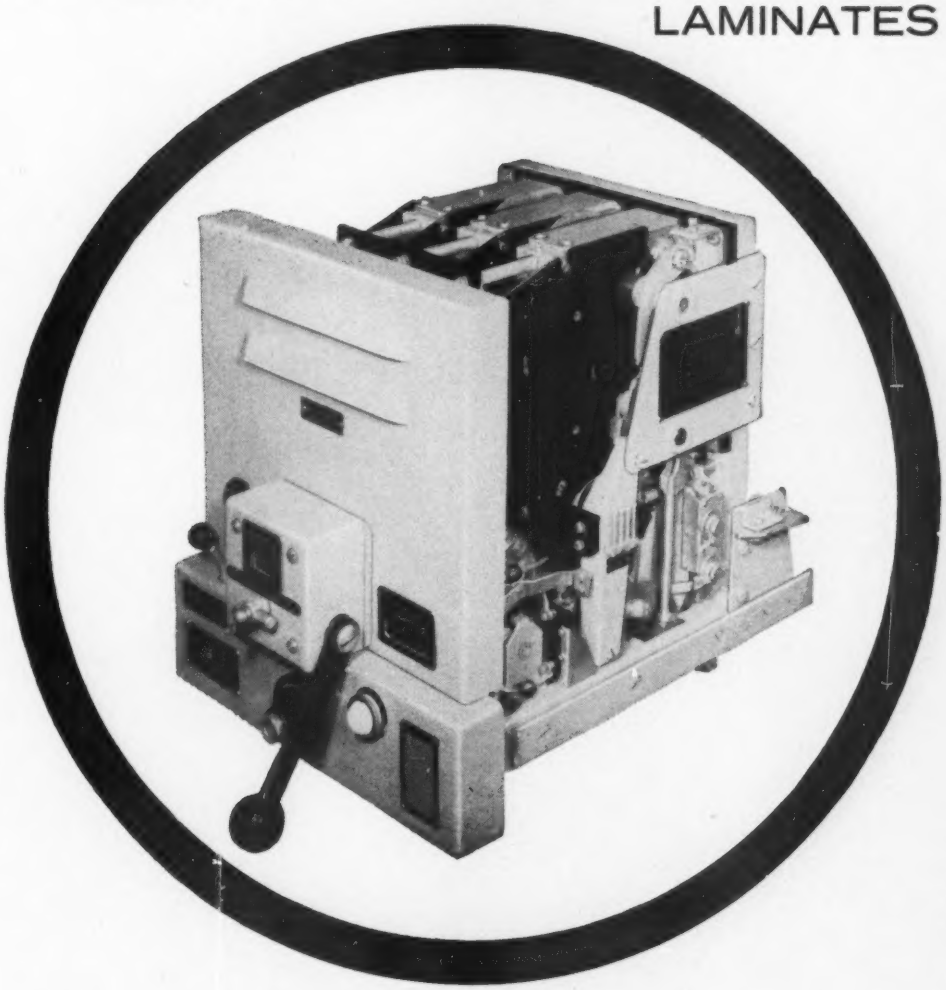
FORMICA Industrial Laminates making big contributions to development in the electrical industry. You'll find various grades, for instance, in this Admiralty Air Circuit Breaker. The choice of Formica, with its remarkable dependability, is a testimony not only from the manufacturer (Crompton Parkinson Ltd.) but also from the Service authorities.

You'll find FORMICA Industrial Laminates in all the best of British products from the smallest valve to the largest generator. High quality is backed by an unsurpassed technical service. Formica Limited make paper, glass, fabric and copper clad laminates, engraving material and inter-laminate prints.

FORMICA* INDUSTRIAL LAMINATES



For full information on FORMICA Industrial laminates write to:

FORMICA LIMITED (Industrial Laminates Division)

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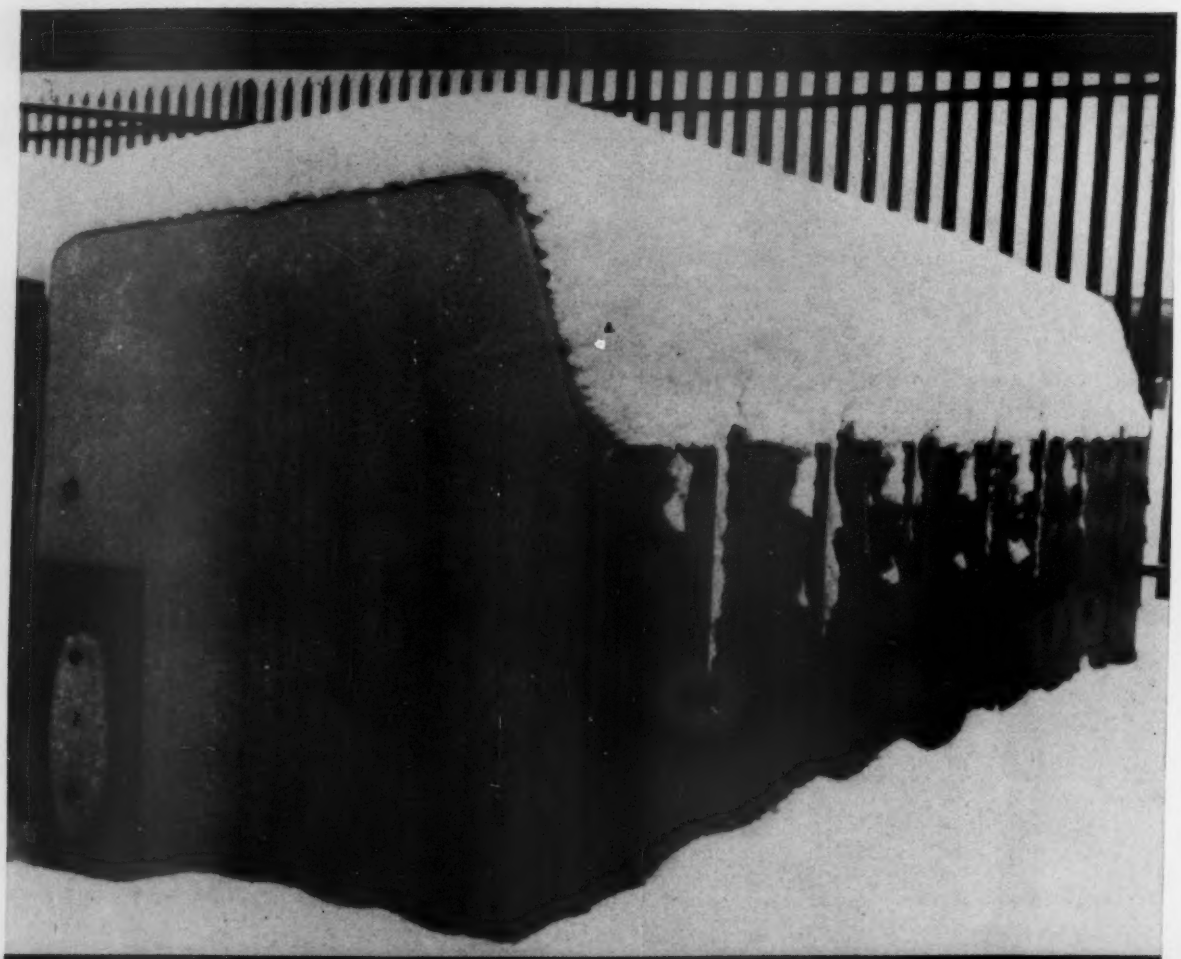

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Y.S. & E.

YORKSHIRE SWITCHGEAR &
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Hot foot on the successful installation of automatic frost protection by under-turf heating at football fields, comes the Greyhound Racing Association's contract for the G.E.C. to install—*for the first time*—under-turf heating at three of their tracks. Harringay London, and Belle Vue Manchester have been completed; White City London will be laid in the near future.

Close-up view of the specially designed David Brown tractor which simultaneously slits the turf and lays the cable.

Below
General view of the Harringay track with cable laying in progress.

And Pirelli-General made the cable...
nearly 11 miles of it . . . 36 lengths of a stranded tinned steel wire encased in a tough p.v.c. sheath . . . each approximately 1,560 ft. long . . . laid 5 in. deep at 4 in. spacings . . . carrying a total load of 270 kW.
The installation is thermostatically controlled, power being switched on when the temperature falls to 32°F.

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THAT PRICELESS EXTRA —

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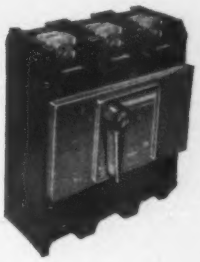
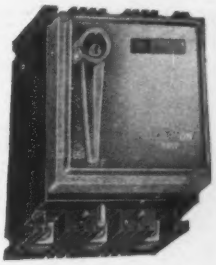
125 to 800 AMP



NJL 400
125 to 400 AMP

NFJ 225
15 to 225 AMP



NEF 100
15 to 100 AMP

SAVE

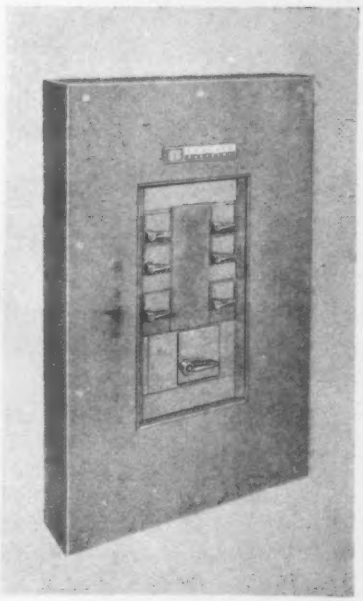
SPACE

COST

TIME

Height — 60"
Width — 38"
Depth — 9"

AS THIS MV PANEL BOARD So clearly shows



Typical CDPR Assembly with 600 amp NM 3 pole main circuit-breaker, busbars and neutral assembly, together with 1-300 and 1-250 amp NJL 1-150 and 3-70 amp NFJ 3 pole feeder circuit-breakers.

British made to British Requirements

E.C.C (MOULDED BREAKERS) LIMITED

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SLIM JIM

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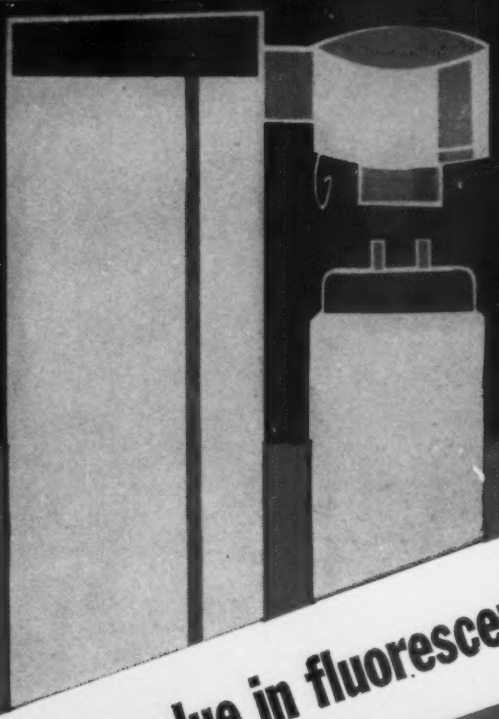

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LIGHTING & HEATING GROUP
THE GENERAL ELECTRIC CO. LTD
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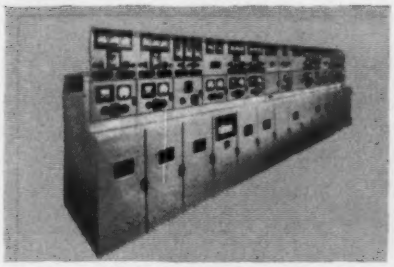
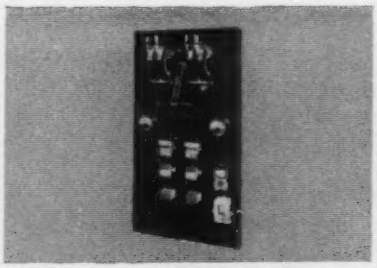
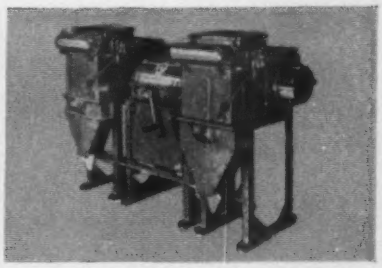


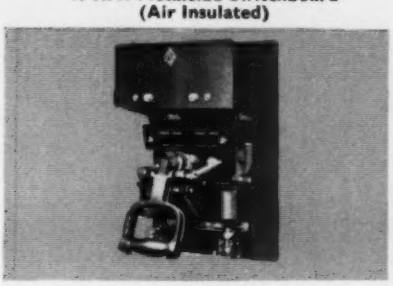
11 K.V. Metalclad Switchboard (Air Insulated)



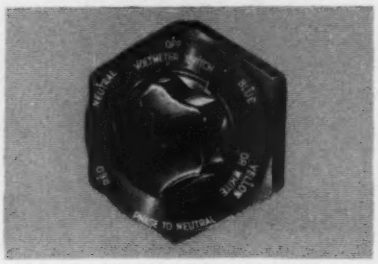
Heavy Current D.C. Circuit Breaker and Knife Switch Panel



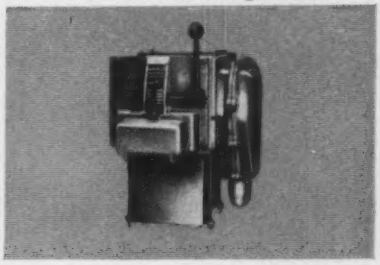
H.V. Ring Main Switchboard with Fuse Switch controlling Tee-Off



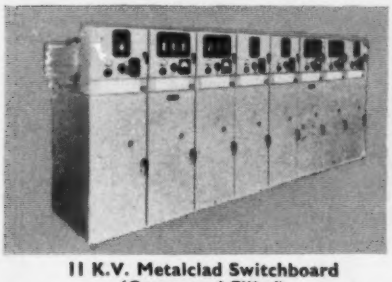
Small Air Circuit Breaker



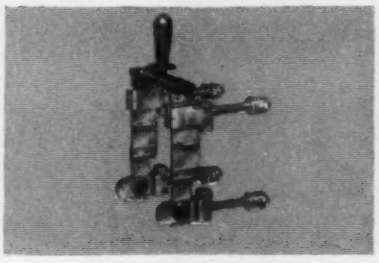
Ammeter and Voltmeter Switches



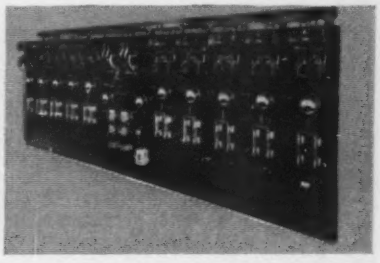
L.V. Industrial Oil Circuit Breaker



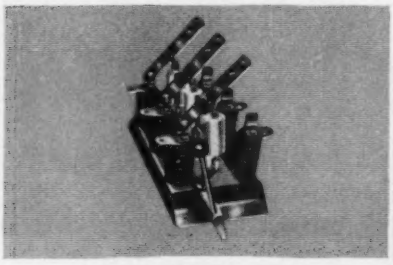
11 K.V. Metalclad Switchboard (Compound Filled)



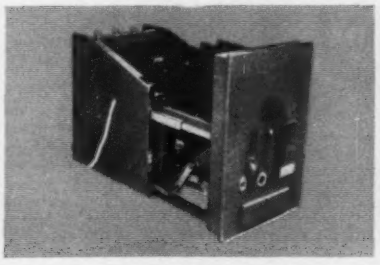
Panel Mounting Knife Switch



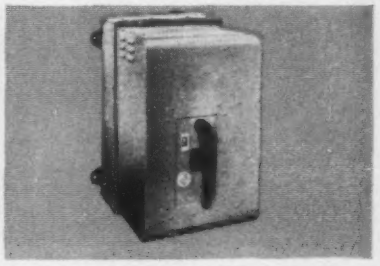
D.C. Switchboard for Steel Works



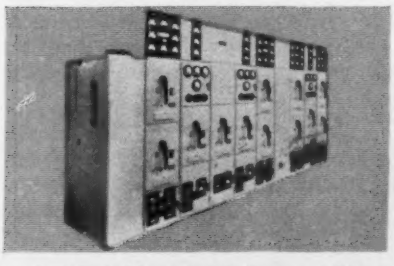
T.P. 11 kV Isolating Switch



L.V. Draw-out Air Circuit Breaker



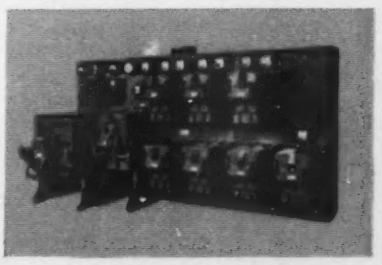
L.V. Metalclad Air Circuit Breaker



L.V. Switchboard with Draw-out Air Circuit Breakers

STATTER

Specialists in Switchgear for over 50 Years



Industrial Switchboard with Drawout Oil Circuit Breakers

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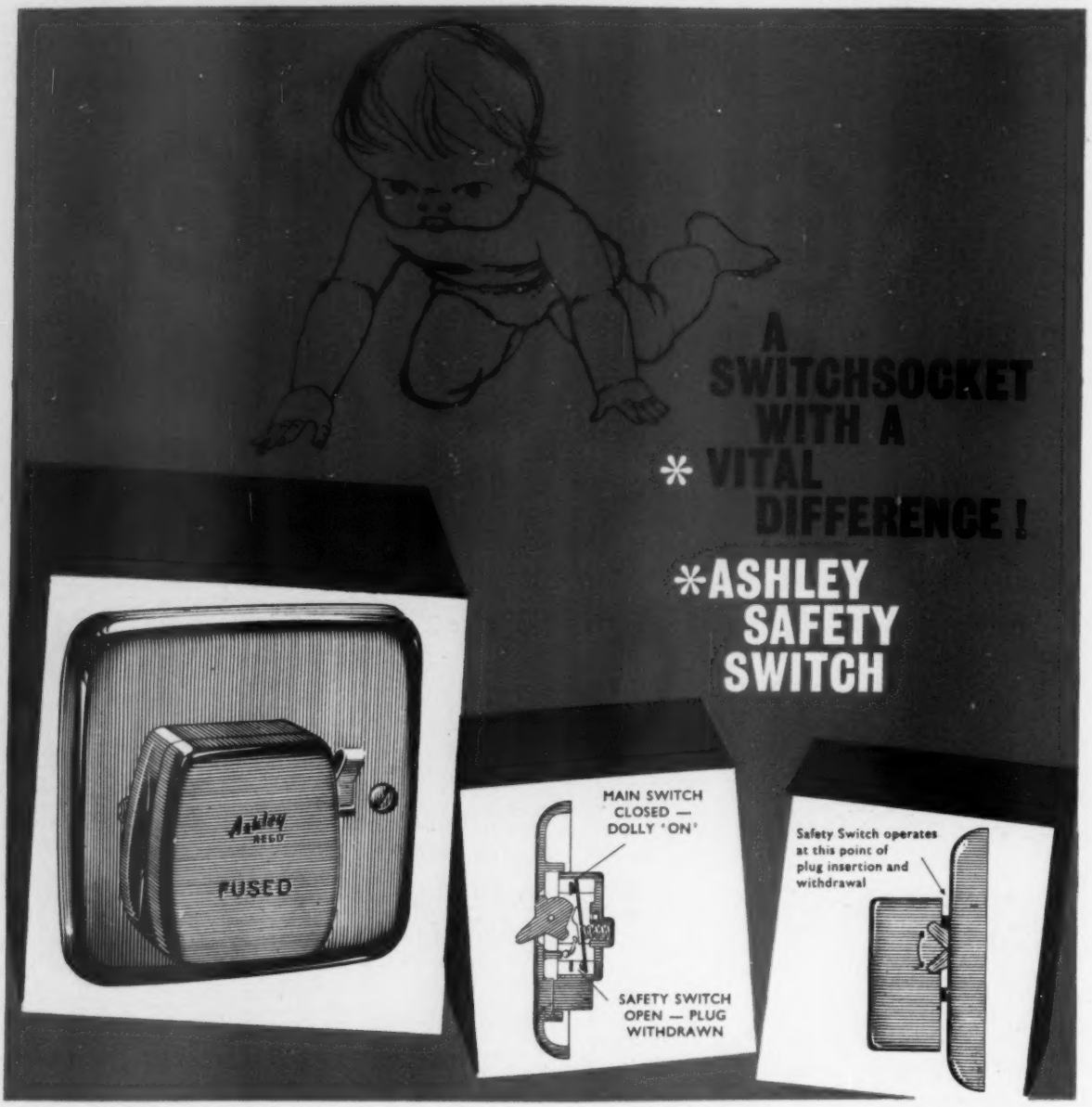
A SWITCHSOCKET WITH A * VITAL DIFFERENCE !
*ASHLEY SAFETY SWITCH
Ashley REGD
FUSED
MAIN SWITCH CLOSED — DOLLY 'ON'
SAFETY SWITCH OPEN — PLUG WITHDRAWN
Safety Switch operates at this point of plug insertion and withdrawal

13 AMP SWITCHSOCKETS		
CAT No	DOZ LIST	TYPE
SS 31	69/-	Surface Br
SS 32	76/-	Surface Cr
SS 35	67/-	Flush Br
SS 36	74/-	Flush Cr
HEAVY DUTY		
SS 41	92/8	Surface Blk
SS 45	81/4	Flush Blk

13 AMP FUSED PLUGS		
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PG 14	38/-	Cream
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ASHLEY 13 AMP SWITCHSOCKET WITH SAFETY SWITCH

The 'Ashley' safety device (patent pending) effectively prevents fingers from touching "live" pins during plug insertion or withdrawal—the pins only being "live" when almost home, an invaluable factor which will readily be appreciated by both individual and corporate users.

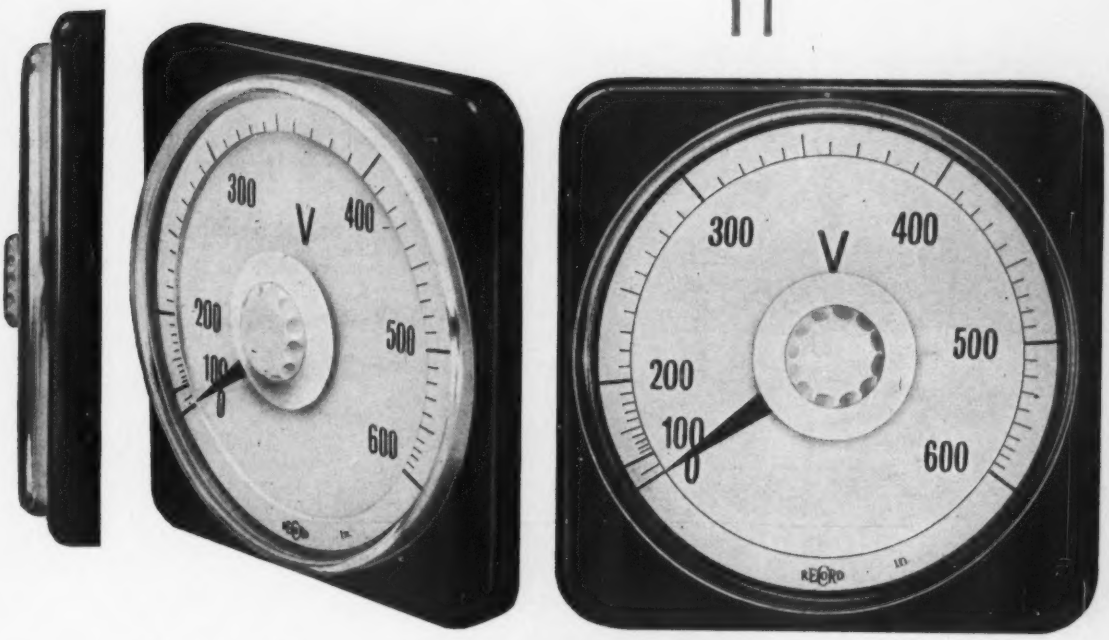
OPERATION: Two switches are used in series in the Line circuit, one (main switch) is controlled by the dolly; the other (safety switch) by the plug. Regardless of dolly position, the Safety Switch controls output during plug insertion or withdrawal. Both switches are fully rated.

Connect with **Ashley** REGD. for Quality

ASHLEY ACCESSORIES LIMITED, Ulverston, Lancashire, England

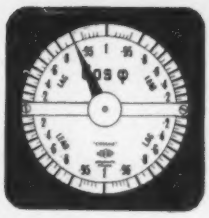
Telephone: Ulverston 3333 Telegrams: Ashley Ulverston

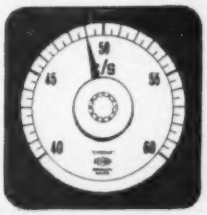
WHICHEVER WAY YOU LOOK AT IT

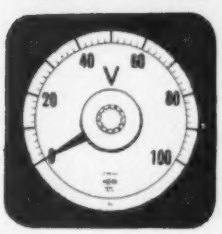


"CIRSCALE" INSTRUMENTS

SERIES A







Whichever way you look at it, "Cirscale" Instruments Series A are first choice for absolute reliability, accuracy and visibility. Robust, compact, styled to match contemporary panel layouts. "CLEAR-VIEW" model illustrated can be read accurately at any angle up to 60° from normal. Other models include hermetically sealed and internally illuminated versions. High torque movements, anti-vibrations mounted, cover full range of A.C./D.C. requirements. Send for folder Ref. A/e.

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M.W. 128

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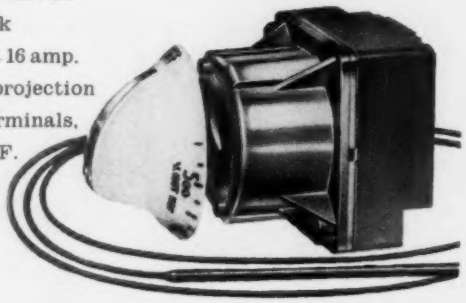

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60 Series (shallow lens) and 80A-82A Series snap-in fixing neon indicators suitable for circular or square panel mounting holes, available for 115, 250 or 415 volt supplies.

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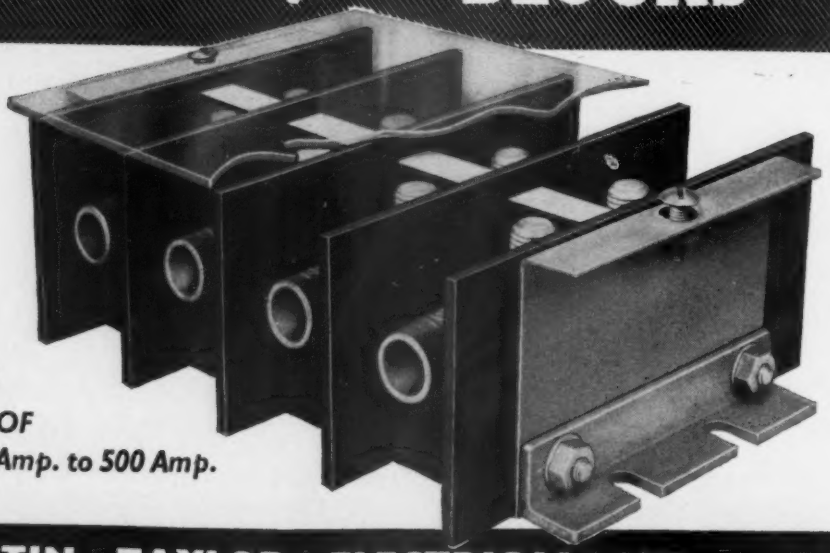

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120, 200, 300
and 500 Amp.
Ratings

WITH SOLID OR
REMOVABLE LINKS

STANDARD RANGE OF TERMINALS FROM 15 Amp. to 500 Amp.

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☐ High strength with light weight ☐ Non-deterioration of fire-retarding properties in all climates ☐ Resistance to corrosion and chemical attack ☐ Resistance to temperatures up to 150°C.

HET ACID for self-extinguishing polyesters

POLYESTER RESINS based on Het Acid have already been used to advantage for: roof lighting and decorative translucent panellings; boat construction; chemical plant; housing for motors and electrical equipment; insulating laminates for switch-gear; ductings in aircraft; the manufacture of radomes, and many other applications. Resins based on Het Acid open up exciting possibilities to fabricators in every field of industrial research and development.

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Right: 75 MVA 275-33 KV Transformer, ON-OFB, with 275 KV neutral end high-speed resistor on-load tap changer, built by Fuller Electric Ltd. for installation at Whitson sub-station for power supply to Richard Thomas & Baldwin's Spencer Steelworks at Newport, Mon. Above: A Permawood transformer winding clamping segment being fixed in position.

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THURSDAY 7 DECEMBER, 1961
Registered as a Newspaper Volume 140 No. 23

ELECTRICAL TIMES

SARDINIA HOUSE, SARDINIA STREET, LONDON, W.C.2
Telegrams: Equivolt . Estrand Telephone: HOLborn 6016

Dans ce numéro

Redresseurs pour l'excitation des gros alternateurs ... 837
Des diodes redresseuses au silicone sont utilisées pour l'excitation des gros alternateurs, dont certains peuvent exiger une excitation d'au moins 2000 kW. Par rapport à un excitateur à courant continu, l'entretien des balais est éliminé, et il n'est plus nécessaire d'avoir une boîte de vitesse entre l'arbre principal et la machine excitatrice. Les alternateurs d'excitation peuvent être du type à rotor en acier forgé, qui présente l'avantage d'une régularité éprouvée, mais les machines dotées de rotors cylindriques laminés peuvent donner une réponse plus rapide aux conditions modifiées. Les redresseurs d'excitation destinés à une machine de 120 MW sont logés dans 12 plateaux amovibles. Ils sont étudiés pour une charge continue à 2.040 ampères, 380 volts, peuvent fournir 2.900 ampères, 540 V pendant cinq secondes pour un champ forcé, et supporter des valures transitoires de crête égales à 9.600 ampères.

Station transformatrice pour le câble traversant la Manche 845
Une station de transformation alternatif/continu située à Lydd comprend deux groupes de tubes redresseurs qui feront passer le courant dans le câble sous-marin entre l'Angleterre et la France. On peut commander l'écoulement de courant dans l'un ou l'autre sense de 0 à 160 MW, à 200 kV, courant continu, par la commande de grille des tubes. Les grilles sont automatiquement reconnectées lorsqu'une inversion de courant est requise. Les groupes de tubes sont connectés au réseau d'alimentation britannique de 275 kV par l'intermédiaire de deux transformateurs redresseurs de 95 MVA ayant des enroulements tertiaires connectés en delta, servant à la connexion à un banc de condensateurs qui fournit la puissance réactive nécessaire.

Chauffage aux rayons infrarouges 849
Des radiateurs électriques à rayons infrarouges ayant la majeure partie de leur intensité située à une longueur d'ondes de 3 microns conviennent pour le chauffage des personnes dans les stades et autres endroits à découvert.

In dieser Nummer

Gleichrichter für die Erregung grosser Alternatoren 837
Siliziumventile werden als Gleichrichter bei der Erregung grosser Alternatoren verwendet, die Leistungen von mindestens 2000 kW erfordern kann. Im Gegensatz zur Verwendung einer Gleichstromerregermaschine fällt hier die Wartung der Bürstenvorrichtung fort, und ebenso wird der Getriebekasten zwischen Hauptwelle und Erregermaschine überflüssig. Die als Erregermaschinen arbeitenden Alternatoren können Schmiedestahlläufer haben, was den Vorteil erprobter Zuverlässigkeit mit sich bringt; doch können Maschinen mit zylinderförmigen, lamellierten Läufern wohl schneller auf Zustandsänderungen ansprechen. Im Falle einer 120 MW Maschine befinden sich die Erregungsgleichrichter in zwölf Einschüben. Sie sind für eine Dauerbelastung von 2040 Ampère. 380 V ausgelegt und können zwecks plötzlicher Felderregung einen Strom von 2900 Ampère, 540 V fünf Sekunden lang liefern sowie spitzen von 960 Ampère standhalten.

Eine Umformerstation für das Kanalkabel 845
Eine Wechselstrom-Gleichstrom-Umformerstation in Lydd arbeitet mit zwei Gruppen von Gleichrichterröhren. Diese sollen den Strom für die Unterwasserverbindung England-Frankreich führen. Ein Stromfluss von 0 bis 160 Megawatt bei 200 kV Gleichstrom kann durch Gittersteuerung der Röhren in beiden Richtungen geregelt werden. Sobald eine Umkehr dieses Stromflusses erforderlich wird, schalten sich die Gitter automatisch um. Die Röhrengruppen sind an das britische 275 kV Kraftnetz über zwei 95 MVA Gleichrichter-Transformatoren angeschlossen, deren Tertiärwicklungen zum Anschluss an eine Kodensatorenbatterie dreieckgeschaltet sind, wobei letztere die erforderliche Blindleistung liefert.

Infrarotheizung 849
Elektrische Infrarotstrahler, deren Leistung grösstenteils mit einer Wellenlänge von 3 Mikronen emittiert wird, eignet sich dazu, Zuschauer in Sportsstadien und anderen frei gelegenen Plätzen warm zu halten.

Rectifier Excitation for Large Turbo-alternators ... 837
by D. B. Corbyn, B.SC.(ENG.), M.I.E.E., *W. W. Holburn,* B.SC., A.M.I.E.E. *and G. M. H. Seydel,* D.F.C., A.M.I.E.E.

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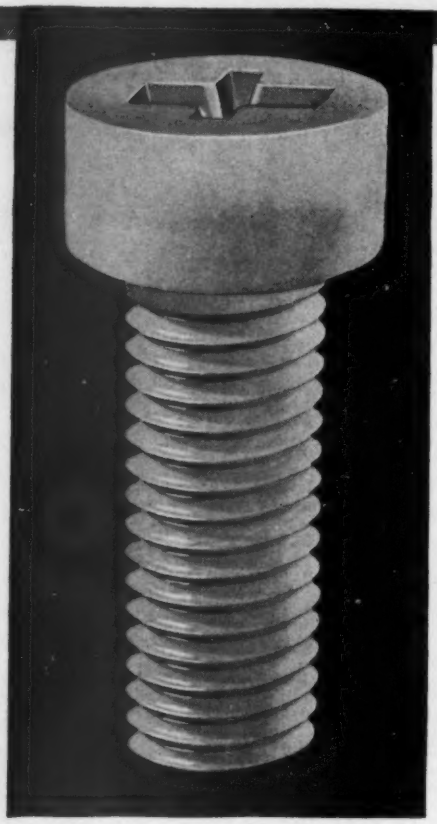

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ELECTRICAL TIMES

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Comment

ACTION ON ADEQUACY

Twenty socket-outlets for a five-in-family, three-bedroomed house—as a minimum. That is the recommendation of the Ministry of Housing committee which reported last week on the needs for family dwellings today. Given wide terms of reference, covering private building as well as local authority activities, the committee have produced one of the first realistic official reports on electrical installations. Twenty socket-outlets compares with the six often accepted as satisfactory at present by local authority planners; the six perforce accepted by area boards as enough to make them waive power to charge for connections to new estates. Fifteen socket-outlets may have to do, the committee say, when costs must be cut to the bone; but they make it clear, 15 is less than satisfactory. This is an opinion which the electrical industry must ring round the country. It is an opportunity not to be missed. The committee was representative enough to command respect and it had no electrical engineers or contractors amongst its membership to bias it in favour of electricity. The trade and the supply industry must now work together to brand as sub-standard anything less than the 20 sockets in an average home, old or new. They should work for more, and again the new report gives the lead in its recognition that the 20 minimum is realistic only for today. It calls for research into wiring systems more adaptable to expansion, so that tomorrow's greater needs may more easily be met. Points of effective pressure must be sought, where this opinion can be hammered home. Area boards can raise their adequacy requirements in the negotiations they hold with local authorities and private developers about charges for new supplies. So far as private builders are concerned, there is scope for persuasive work with the National Housebuilders' Registration Council, whose standards are likely to be increasingly recognised. "Twenty at least" is the motto the new report gives for all interested in wiring adequacy.

TOMORROW'S HOUSING STANDARDS

The section on electrical installations, vital though it is to the electrical industry, is a small part of the overall report, "Homes for Today and Tomorrow." The whole question of houses and flats under modern conditions is discussed at length. The committee bases its report on wide-ranging inquiries; they were extremely active in circulating a questionnaire just over a year ago, and since then have organised many corporate visits to cross-check opinion on housing. Two recommendations, which the committee themselves regard as outstanding, both hold interest for the electrical industry. The first—reflecting the surge in demand

of recent months—is that the house of the future will be all-heated. Conventional central heating comes to mind and, electrically, that means floor-warming, so far as the committee are concerned. But the means discussed and the inevitably contentious comparative estimates of cost suggested are of secondary importance compared with the main findings, that effective whole-house heating is wanted for the future and that it will not be based on any form of open fire. That spells sales potential for supply industry and electrical manufacturers alike. The other main recommendation concerns space, and the kitchen figures prominently as a part of any dwelling where more space is needed—floor space for the major electrical appliances and storage space for the growing number of portable appliances that ease the housewife's day.

LINK WITH EUROPE

When the cross-Channel cable link is inaugurated tomorrow, the supply industry will be achieving something that other parts of the British economy have been busy talking about. With the European Common Market daily in the news, there is a symbolic appropriateness about the tariff-free interconnection which, through the French grid, links the CEGB with most of Western Europe. Yet the timing is topical only because of the remarkable gradualness with which this scheme has proceeded since the initial discussions between the two authorities in 1949. Indeed, there is irony in the fact that the question of a Channel tunnel, now a possibility again, was a factor in the early discussions. It was decided that since the tunnel was not in prospect, the possibility of a submarine link should be investigated. After the initial studies, an a.c. link was envisaged, but the prospect of joining two large systems through a link of modest capacity always looked questionable from the frequency variation aspect. It was 1956 before the recommendation was changed from a.c. to d.c., with the claim that there would be cost savings as well as operational advantages. The d.c. link will permit an evaluation of d.c. submarine cable possibilities that is likely to make the Channel scheme the reference point for many further developments across the world. Cook Strait in New Zealand will, in particular, benefit from all that is learnt. The proposed capacity there of 600 MW represents a smaller capacity leap than the 8:1 ratio from the pioneering Gotland d.c. submarine link to today's Channel venture.

CLOUDS OVER COAL

Steadily, the picture of the coal industry future darkens so far as electricity is concerned. Last week brought a tumble of statements affecting both short-term and long-term prospects, and all were unrelieved disadvantage. Most immediate in its effects was the price increase announced for coal from the Scottish and North Western divisions of the NCB. These geographically selective price increases have been made largely because the NCB have accepted the need for a further measure of realistic pricing on a coalfield basis. Production costs in those divisions are disproportionately high. Against the idea of spreading the costs over the whole price structure of the NCB is the consideration announced by the Minister of Power—that the Board are convinced that the coal industry has reached the point where further general price increases would be increasingly harmful. The current negotiations with the NUM about wages raise the question whether the present price position will be held, despite the increase in productivity which the NCB is claiming. If prices do rise, and some of the present coal users are frightened away as a result, what about the supply industry? It is effectively tied to the use of coal once a station has been erected for that alone; and if sales go down, then the price to the remaining users may well go up. That is not a welcome prospect. Nor, from another approach, is the shortage of miners reported from the very NCB divisions on which the CEGB is relying for the fuel for its super power stations, the East Midlands and Yorkshire divisions. The freedom to manoeuvre in a three-fuel economy, which Sir Christopher Hinton has been asking for, seems fully justified and firmly needed by the Board.

A.C. EXCITERS

It is only a few years since the development of germanium and silicon rectifiers made possible the use of a.c. exciters for large turbo-alternators. The first set using germanium rectifiers was commissioned in 1958 and the first silicon rectifier set earlier this year. The clear advantages of the a.c. exciter design over the d.c. exciter so long established have matched with satisfactory initial operating experience to cause the CEGB to state in their last annual report that all large generators are in future to have static silicon rectifier a.c. exciters directly driven from the main shaft and voltage regulators incorporating magnetic amplifiers. Our article this week thus sketches the background to an important development in power engineering. Since the design it describes was developed, rectifier characteristics have improved to the point where forced air-cooling has been abandoned for natural convection, and the equipment has become compact enough to be housed in the alternator foundation block. Further than that, the good progress being made with silicon-controlled rectifiers is bringing about the possibility of their replacing the magnetic amplifier in the associated control scheme. Without a.c. excitation the development of the largest machines would have been complicated by limitations on output of practicable d.c. exciters. Now the point of concern is likely to be the question of collecting a.c. current at slip-rings. If the rectifiers can be shaft-mounted, then a truly brushless machine is obtained—and a 60 MW prototype along these lines is reported in service in the US, as well as the smaller examples common here and elsewhere in the world.

Meteor

This week's quick summary of electrical news faces advertisement page 16

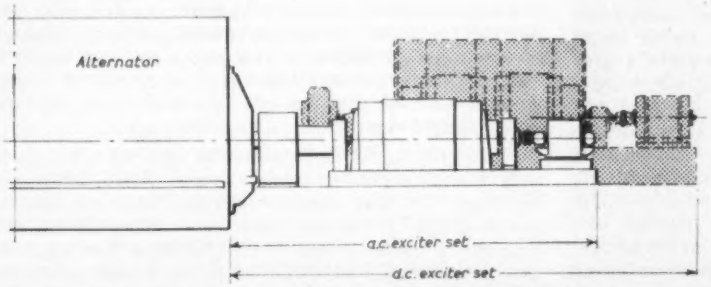
Rectifier excitation for large turbo-alternators

by D. B. Corbyn, B.Sc.(Eng.), M.I.E.E., W. W. Holburn, B.Sc., A.M.I.E.E. and G. M. H. Seydel, D.F.C., A.M.I.E.E.*

THE growth in capacity of electrical power systems has been accompanied by a continued demand for larger steam turbine generator units. The two-pole alternator has been progressively developed to meet the increased ratings, and among the problems faced by designers of this type of machine has been that of providing an excitation system in keeping with the high standard of reliability required.

The exciter with its armature overhung from an extension of the alternator rotor shaft provided the best solution for the smallest sets. This arrangement was simple, provided good accessibility to the brushgear, and had no additional bearings. On alternators larger than 10 MW, the increasing weight of the exciter armature began to introduce vibration troubles which led to unsatisfactory commutation. The two-bearing, flexibly-coupled exciter followed at this stage, and was extensively used for sets up to about 60 MW in output. Some manufacturers developed larger exciters of this type, but for excitation power greater than about 200 kW, the low speed machine, with its inherently less sensitive commutation, was generally preferred. Normally the drive was taken through reduction gears from the alternator shaft, but many separately-driven exciter sets have been installed.

The very highly rated alternators which are now being manufactured require excitation power in excess of 2,000 kW and even larger exciter outputs are anticipated. A reasonably low slip-ring voltage is necessary for safe operation, and consequently excitation currents of the order of 4,000 A result. D.C. exciters for this duty have large numbers of brushes, and maintenance requirements tend to become excessive. The provision of adequate access to the brushgear conflicts with the design of the ventilation circuit, and although there have been many improvements in the arrangement, it is impracticable to obtain ideal conditions for an operator to change brushes while the plant is running. Furthermore, d.c. generators for such large outputs must be relatively low-speed machines in order to obtain optimum conditions for commutation. This results in a disproportionate increase in the size of the exciter and gearbox, which may add to building costs and significantly increases the torsional stresses in the shaft system following electrical fault conditions.



▲ *Fig. 1. Comparison of a.c. and d.c. exciter arrangements for a 500 MW turbo-alternator set. The a.c. alternator is coupled directly to the main alternator shaft, and reduces overall length by about 7 ft*

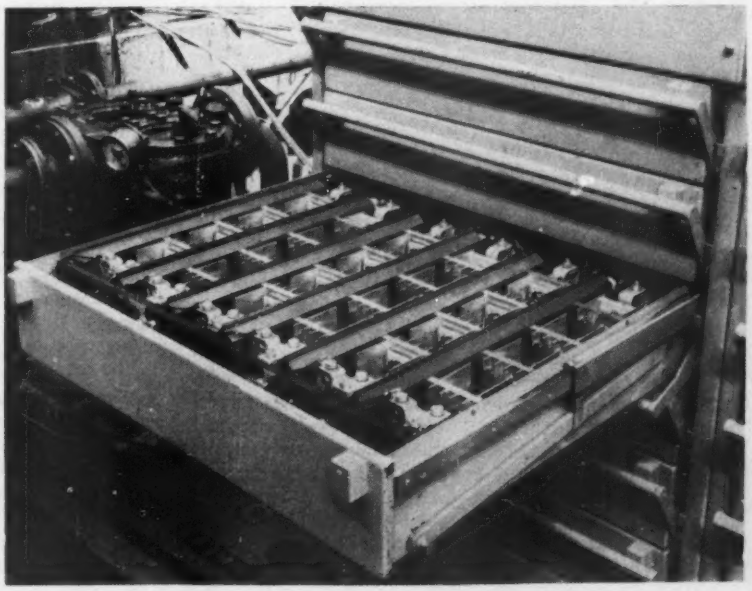


Fig. 2. Tray withdrawn from rectifier cubicle, showing silicon cells, cooling fins and protective fuses mounted on removable fibreglass sections. The equipment comprises 12 such trays ▶

* All the authors are with the English Electric Co. Ltd.

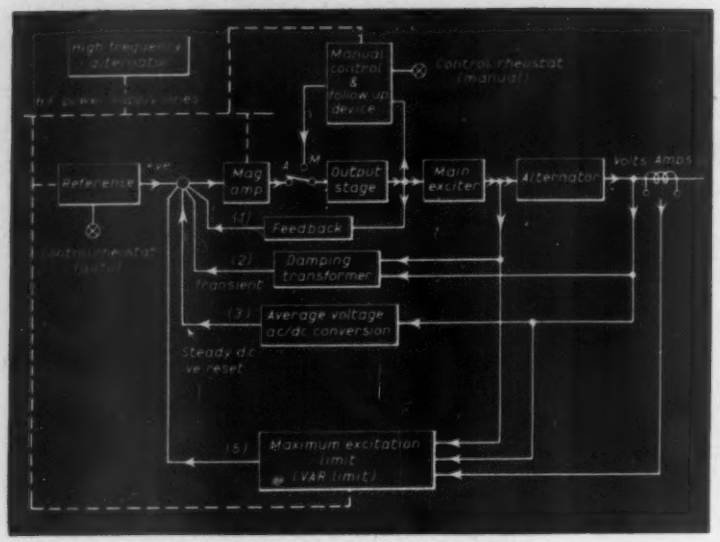


Fig. 3. Block diagram of voltage regulator

Rectifier Excitation

Rectifier excitation schemes have obvious advantages, as an a.c. exciter without heavy current brushgear can then be used. The consequent saving in brushgear maintenance is one of the major attractions of this alternative, but the exciter alternator, coupled directly to the main alternator shaft, also brings about a reduction in size and inertia, eliminates the gearbox and simplifies the design of the ventilation system. A reduction in overall length of about 7 ft is illustrated by Fig. 1, which shows a comparison between a.c. and d.c. exciter arrangements for a 500 MW set.

The acceptance of rectifiers for this application has been made possible by the recent developments in semiconductor type rectifiers, particularly the silicon-junction diode cell. To ensure maximum reliability, the latest techniques with regard to protection and fault indication, together with adequate standby capacity, are incorporated in the units.

The voltage regulator and field suppression equipment need not depart from accepted present-day standards. A direct-coupled, high-frequency alternator of suitable rating, together with a static magnetic-amplifier, can be used to supply the main exciter field, replacing the commutator machine normally used for this purpose in the case of d.c. excitation systems.

There is some latitude in choosing the type of a.c. exciter, particularly for the smaller sets. Induction machines have the advantages of a static field circuit and robust construction of rotor, without windings or slip-rings. Their high a.c. reactance and poor regulation make these machines less suitable for very large sizes and necessitate relatively inefficient means of controlling the output. The high-speed salient pole machine has attractive electrical characteristics and is more economical for the smaller units. Mechanical difficulties in supporting the poles impose a limit to the possible rating, and the machines are not practicable for the highest outputs. A.C. exciters with cylindrical laminated rotors can be made for the largest ratings at present envisaged and have good electrical characteristics. If, as present trends appear to indicate, increased importance is placed on rapid exciter response, this type of exciter may gain favour. The turbo-type alternator, with forged steel rotor, is subject to additional heating due to harmonic currents produced by the rectifier load, and the constructional features are not appropriate for a multi-pole design with low field inductance and time constant. Nevertheless, the solid rotor machine has the advantage of proved reliability which, for this application, tends to override other considerations. Normal British Standard response requirements can be met by the provision of adequate forcing power, on exciter sets for machines up to 500 MW.

Choice of Control Schemes

The old standard excitation and control scheme for large steam sets included a d.c. main exciter and a d.c. control exciter. The new scheme described below applies particularly to a typical 120 MW turbo-alternator and is generally typical of present-day practice in magnetic amplifier control circuits.

When the main exciter is an a.c. machine supplying the rotor through a rectifier, it is considered better to replace the control exciter by a magnetic amplifier having a single-ended power output stage which can be used for manual control. The control components are now all static in an arrangement requiring no servicing or maintenance. The control power is supplied from a permanent-magnet, high-frequency alternator, without slip-rings, again requiring no maintenance. This supply is used for both manual and automatic control.

Any up-to-date automatic voltage regulator operates without dead-band as a direct result of comparing the alternator output voltage continuously with a constant reference voltage. Regulator loop gain is high and response rapid, so that the smallest deviation of alternator output voltage is sensed, and the full correcting signal appears, on the output stage in 30 to 40 milliseconds.

For simplicity, the turbo-alternator type exciter is made with a conventional single-field system having only two slip-rings. The static regulator can only force the field in one direction; to increase output. To reduce output, the magnetic amplifier output is reduced to a minimum, so that the decrement of excitation is the natural time constant of exciter field plus main alternator field. This is not found to be in any way detrimental to the operation of the machine either under steady state or fault conditions.

If a fault occurs, the regulator must boost the machine and the available forcing brings the exciter output to ceiling voltage in less than a second. As the fault is cleared, the amplifier output is reduced until steady state excitation is once more obtained. With conventional d.c. machine excitation, both control and main exciter fields are forced in the negative direction to return to the steady state condition and a rapid settling down is achieved. It is found that the relatively slow restoration of the a.c. exciter under these conditions causes no difficulty.

The rating of the rectifiers in the a.v.r. output stage is governed by the forcing conditions and possible fault currents in the a.c. exciter field during a short-circuit on the main alternator terminals.

A rectifier adequate for these two conditions has a large safety factor when the output stage is used for manual control, where power handled is only about one-quarter of peak output. Because of this generous rating the use of the output stage for manual control is justified since reliability is assured.

Fig. 3 shows a block diagram of the voltage regulator. The error signal "E" fed into the first stage of the

magnetic amplifier is the difference between the positive reference and four negative feed-backs.

Two of these feed-backs (1 and 3) have a steady state d.c. level; one is the gain-setting feed-back proportional to final regulator output, the other is the reset voltage corresponding to the rectified average a.c. voltage of the main alternator.

The other feed-backs give transient signals for stabilisation. One is from the damping transformer, the primaries of which are connected to both the exciter output and main alternator output. The damping transformer output signal is proportional to the rate of change of its input signals. The final signal is derived from a special minimum excitation limit circuit which prevents the machine reaching a dangerous condition where it may lose synchronism.

Fig. 4 gives a simplified schematic diagram of the voltage regulator circuit omitting the stabilising feed-backs (1 and 2). The error signal "E" appears across points X_1 and Y_1 and is fed to a first stage push-pull magnetic amplifier preceding the output stage.

A follow-up circuit ensures that, during steady state conditions, the manual rheostat is adjusted until the follow-up circuit equalises the first stage mag-amp output at points X_2 and Y_2. This ensures that, at any time, the a.v.r. can be cut off without changing the excitation of the machine. The balance indicator must be at zero to change from "auto" to "manual" or vice versa. This indicator reads the error signal at X_1 Y_1 on "auto" and at the first stage output X_2 Y_2 on "manual."

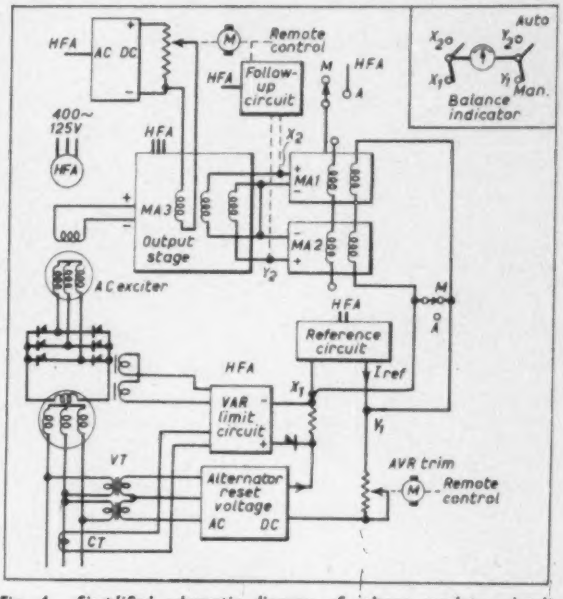


Fig. 4. Simplified schematic diagram of voltage regulator circuit omitting stabilising feedbacks (1 and 2 of Fig. 3)

Choice of Rectifier

Once rectifier excitation is accepted in principle, the choice lies between a rotating rectifier, giving a completely brushless machine, or a static rectifier feeding a rotor with conventional slip-rings. It was decided to use rectifier excitation for a typical 120 MW machine and, at the time the decision was taken, only the static rectifier was considered sufficiently reliable for full commercial service.

A static rectifier can derive its power from an exciter alternator, from special windings in the main alternator slots, or by self-excitation from current and voltage transformers. An exciter alternator was chosen, because this was a well-proven device and the only one known to be sufficiently reliable for full commercial service.

It must be assumed that the alternator will run virtually continuously, without any planned shutdown, and that instant restarting is essential after an involuntary shutdown. This requires an excitation rectifier fully protected against internal faults, having adequate reserve capacity, immune from damage by any conceivable fault on the alternator and so arranged that all parts remotely liable to failure can be repaired or replaced without shutdown.

Protection against internal faults such as failure of a rectifier cell, or a surge suppression capacitor, is given by specially-designed fast-acting fuses, producing little overvoltage when clearing. A short-circuited rectifier string is disconnected immediately by its fuse. No other fuses blow. There are sufficient rectifier cells to allow continued operation with up to two faulty strings per arm of the bridge. Main fuses all have small "striker pin" fuses in parallel. When a fuse blows the striker pin is ejected, operates a microswitch and gives an alarm.

In normal operation, full load is carried indefinitely followed, at any time, by an overvoltage for field forcing not normally associated with an overcurrent.

External faults must under no circumstances damage the excitation rectifier, and if the alternator is capable of restarting, the rectifier must be available and no fuses must blow. The most severe external faults are stator short-circuit, out-of-step operation and slip-ring flashover.

A stator short-circuit on the main alternator induces, in the rotor, a large transient direct current with a decay time constant of about one second, and a fundamental frequency current with a decay time constant of about one-quarter second. Rectifier peak current may reach six times normal, occurring on the same rectifier arm every cycle. A typical event is shown in Fig. 5.

On a "unit" fault the main generator circuit-breaker and field-suppression breaker clear instantaneously and the a.v.r. reduces exciter output voltage. The field-suppression breaker first connects a discharge resistor across the rotor, then opens the field circuit. Overvoltages produced by breaker opening are suppressed by a R-C network and high frequency voltages are bypassed to earth by small earthed capacitors.

If the main turbo-alternator falls out-of-step, an alternating voltage at slip frequency is induced in the rotor. One half-cycle produces a current in the excitation rectifier, less than the peak current on stator short-circuit. The other half-cycle produces an overvoltage in opposition to the output of the rectifier, which is designed to withstand up to four times nominal (m.c.r.) voltage allowing ample safety margin. The rectifier must withstand these repeated cycles for a limited time.

A slip-ring flashover imposes a short-circuit on the rectifier output. The exciter alternator overload protection, if provided, shuts down the equipment and in these circumstances, rectifier fuses should not blow.

Rectifier cells and fuses are so co-ordinated that cells are never damaged even if absence or failure of protective gear results in wholesale loss of fuses.

Complete failure of the rectifier cooling system operates an alarm. If the failure is not remedied the alternator shuts down after 2½ minutes delay. Duplication of fans and power supplies makes such a failure extremely unlikely and no other foreseeable rectifier fault can cause a shutdown of the alternator.

The rectifier equipment was designed to occupy minimum space by the use of air blast cooling with duplicated fans and auxiliary power supplies to ensure reliability.

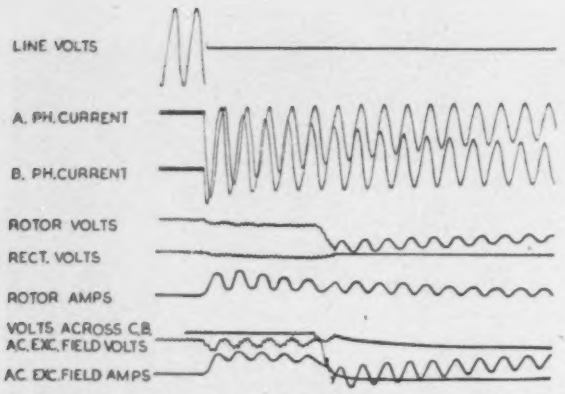


Fig. 5. Test oscillograms for three-phase short-circuit of 120 MW machine from 13·8 kV initial line voltage. Opening of the field suppression breaker was time-delayed for five cycles after the short-circuit

Future rectifiers, discussed later, will more often be natural convection cooled.

Typical Rectifier Excitation Scheme

The a.c. exciter for the prototype rectifier excitation scheme for a 120 MW turbo-alternator is a conventional machine similar in most respects to a small house service alternator. Nameplate rating particulars are:

304 V, 1,960 A, 890 kVA, 0·95 power factor, three-phase, two poles, 3,000 r.p.m., 50 c/s.

The stator comprises a conventional core and basket type distributed winding, but frame and bedplate are tailored to fit the foundation arrangement designed for the d.c. exciters and gearbox which the a.c. exciter supersedes. Cooling is effected by a closed air ventilation circuit with water coolers mounted on each side, above the engine room floor level. The rotor is constructed from a single-piece steel forging wound with concentric coils supported at the ends by non-magnetic retaining rings, as is normal.

A flexible, gear-type coupling connects the exciter to the main alternator shaft extension. As this does not locate the rotor position axially, suitable thrust bearings are incorporated in the coupling end pedestal.

There are two brushes per ring to collect the exciter field current, the power for which is supplied, via the voltage regulator circuits, from a 25 kVA permanent magnet 400 c/s alternator overhung from the rotor shaft extension. The arrangement was designed with particular emphasis on reliability. The exciter time constant was made reasonably short, and sufficient forcing power was provided to obtain a response comparable with the equivalent d.c. machine.

As the scheme is a prototype, full protection of the a.c. exciter, including the customary differential and overload relays, was incorporated. This feature is unlikely to be repeated on future sets, as the inherent high reliability of the a.c. exciter does not warrant such protection and the presence of superfluous relays may itself prejudice reliability.

The excitation rectifier was designed for 2,040 A, 380 V continuously, a ceiling of 2,900 A, 540 V for for five seconds when forcing, and transient peaks during the worst stator short-circuit of 9,600 amps. These values leave ample margins over the worst foreseeable conditions. Additionally, 780 A, 102 V was required for no-load excitation with all cooling fans out of action.

Rectifier cubicles are shown in Fig. 2. Rectifier cells, cooling fins and fuses are mounted on removable fibre-glass sections carried in 12 withdrawable trays (Fig. 7), of which any ten are adequate for continuous operation at maximum output. These trays carry "cluster" contacts of

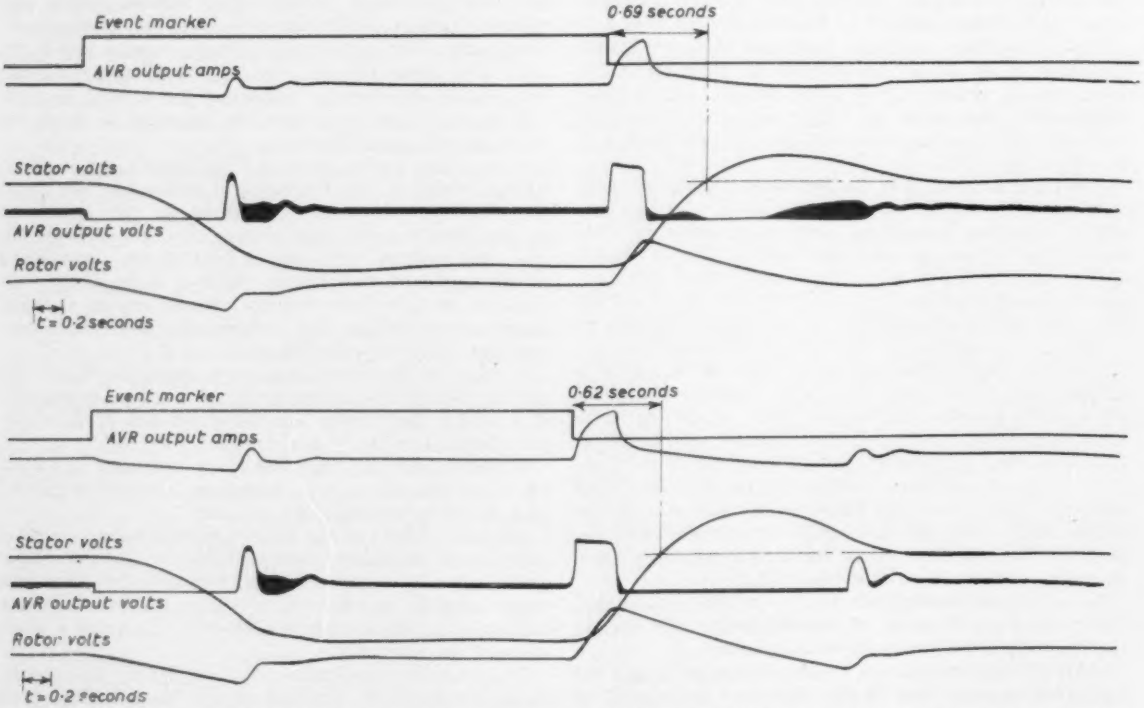


Fig. 6. Test oscillograms for 120 MW machine, showing open-circuit response of alternator to 10% voltage step. The two sets of traces refer to two different damping conditions

the plug and socket type at the rear and are withdrawable under load, for cleaning or repair. A pull bar, linkage and toggle mechanism, ensure easy withdrawal and insertion of trays and prevent short-circuit forces expelling a tray.

Blown rectifier fuses are detected by the striker pin fuses mounted in the front of the trays. Auxiliary signal wiring operates at 12 volts and enters the tray by small plug and socket connections. There is no small signal wiring outside trays at main circuit potential.

Each cubicle has duplicate tandem cooling fans (720 r.p.m.) mounted, with auxiliary components, behind the upper panels. One fan is supplied from each station auxiliary supply and each is capable of cooling the cubicle fully when operating alone.

If any one fan tray is withdrawn, an air baffle ensures uninterrupted cooling by the remaining fan so that a complete overhaul of cooling fans and auxiliary circuits can be carried out under load.

Fig. 8 shows the cubicle containing the mixing circuit and first stage of the regulator together with means of protection and control. The right-hand panel contains one setting rheostat for manual control and another for automatic control. A set of push buttons is available to operate the machine during commissioning. Two meters are shown, a balance indicator and a monitoring meter. Two switches select various positions for the monitoring meter to facilitate fault finding and maintenance. The three panels in the left-hand cubicle correspond to another three panels arranged back-to-back. The bottom of the left hand cubicle includes the switches for the high frequency supply for manual and automatic control, various fuses and links and a test block. Five relays shown at the top include the main auto-manual control relay, the a.v.r. lockout relay and protective elements for over-excitation, undervoltage, manual control failure and, finally, various auxiliaries.

Fig. 9 shows the output stage cubicle. One of the three transductors appears on the left-hand side with an output rectifier below it. The main three-phase transformer is connected delta interstar to obtain the most favourable conditions of balanced load when the amplifier is firing.

The field suppression breaker is of the conventional cubicle type with blowout coils and a large arc chute. The auxiliary contacts for the field discharge resistor are small since the duty is light.

Test oscillograms are shown in Fig. 5 for the case of a full three-phase stator short-circuit when running on open circuit at nominal voltage. The field suppression breaker was time-delayed to open about five cycles after the short-circuit and then reduced current to zero in about 15 milliseconds. The traces show a complete absence of severe rectifier overvoltages and the rapid reduction of exciter alternator field current by the magnetic amplifier controller when the field suppression breaker opens.

Fig. 6 gives test oscillograms showing open circuit response of the alternator to a 10% voltage step. Two different damping conditions are used. The stepdown is not affected by the damping since the output stage cuts off for nearly one second in both cases. In the increasing direction the stator voltage overshoot is almost doubled for a slight change in time necessary to first cross over (0·69 sec to 0·62 sec).

Future Developments

The a.c. power supply for excitation purposes may be taken from:

(i) "Exciter" machines designed especially for the purpose and running either directly coupled to the main alternator or separately driven.

(ii) Special windings accommodated in the main alternator slots, to generate at a harmonic frequency.

Fig. 7 (below). General view of rectifier cubicle, showing the 12 withdrawable trays. Each cubicle is cooled by duplicate tandem fans, each capable of fully cooling it

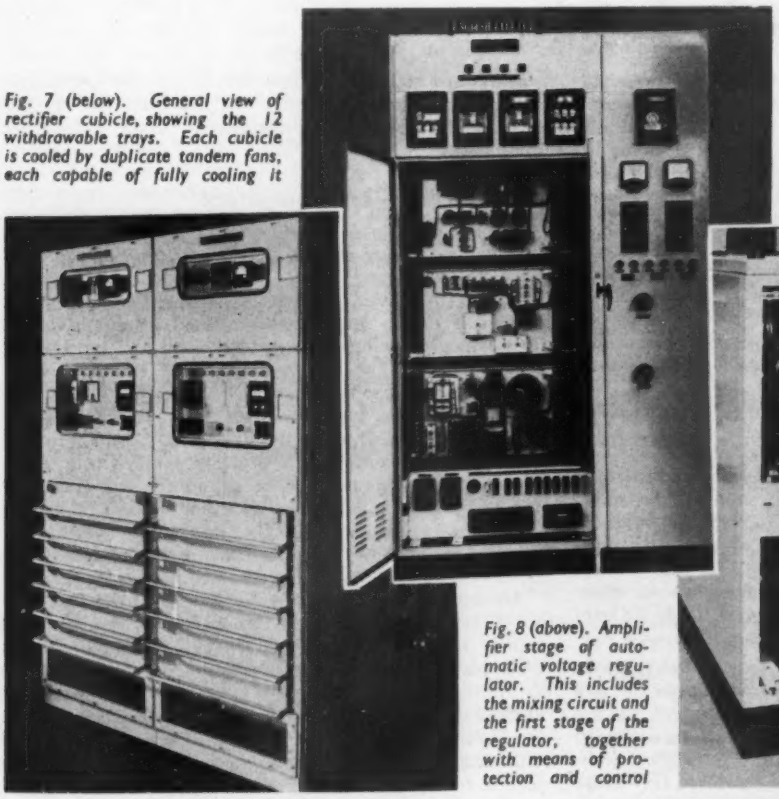
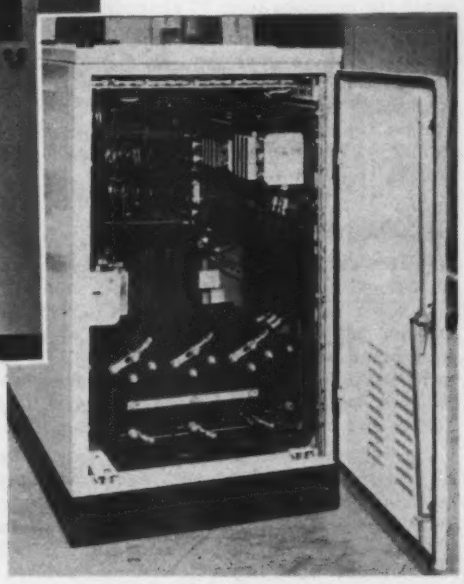


Fig. 8 (above). Amplifier stage of automatic voltage regulator. This includes the mixing circuit and the first stage of the regulator, together with means of protection and control

Fig. 9 (below). Output stage cubicle of automatic voltage regulator. On the left can be seen one of the three transductors, with an output rectifier below it



(iii) Self-excitation from current and voltage transformers.
(iv) A brushless alternator feeding rotating shaft-mounted rectifiers.

All the above alternatives have been used: (i) is most universal at present; (ii) and (iii) have the advantages of being completely static systems and should therefore require less maintenance, and have a response rate independent of any exciter machine parameters. Static self-excitation systems are mostly confined to smaller sets at present, but further developments in the larger range can be expected as the scope of the various control devices is increased. Rotating rectifiers are mainly in the experimental stage for large machines but are already quite common in aircraft and other small alternators.

Future control systems are likely to make much greater use of silicon-controlled rectifiers with the virtual elimination of the magnetic amplifier giving some reduction in size and slightly faster overall response.

Semiconductor technique has developed rapidly since the prototype equipment was designed. Some 20 large generators with outputs 300 MW to 500 MW/single shaft unit are now under construction in the United Kingdom using static rectifiers and exciter alternators. The excitation system is similar to that described except that the main rectifiers are natural convection cooled comprising a number of cubicles each equipped with load break isolators.

The increase in power handling capacity of rectifier cells has so improved the power output per cubic foot of equipment that the small increase in size for naturally cooled rectifiers is no longer an embarrassment and the rectifiers can be housed in the alternator foundation block.

The silicon controlled rectifier, already much used in control systems, is developing very fast. This device is tending to supersede the magnetic amplifier and is applicable to all schemes. Schemes (i), (ii) and (iii) involve slip-rings. Scheme (iv) gives a truly brushless machine and is already in commercial use, with diode rectifiers, for small alternators up to 1 MW and in one experimental alternator of about 60 MW now in service in the U.S.A.

Conclusion

Turbo-alternator sizes will continue to increase and the 500 MW single shaft machines at present on order by no means represent the ultimate limit of size.

Excitation requirements of large turbo-alternators, above 300 MW, are now over 3,000 amps, and exceed the desirable limit for d.c. machines for this purpose.

The silicon rectifier is the only device able to meet the needs of these very large machines and, in fact, further machine development would have been severely handicapped without suitable semiconductor rectifiers. For the immediate future the static rectifier, conventional rotor and direct driven exciter alternator are certain to be used, in spite of the difficulties of heavy current slip-rings. Much study, both economic and technical, is proceeding in order to establish which excitation scheme offers the greatest overall advantage. Whatever system is used for the main excitation we can expect much more sophisticated controllers in future, receiving information from machine and supply network, processing this and finally governing the machine and controlling its excitation from one centre.

I.E.C. Talks in London

DURING a fortnight of committee and sub-committee meetings held at British Standards House, London, the International Electrotechnical Commission took one step further towards the achievement of its aims to establish international agreement on standards for electronic components, equipment and testing procedures. Some 160 delegates from 17 countries attended.

Four specifications incorporating the agreed IEC recommendations were approved for publication. These were sheet No. 1 for rotary switches, vibration tests for use at frequencies below 3 Mc/s, amendments to the IEC specification for sockets for electronic tubes and valves and Test R, "Container Sealing," for inclusion in publication No. 68.

Documents Circulated

Fifteen other documents were approved for circulation to national committees under the six months rule which allows the various committees this interval in which to examine the documents and decide whether the draft recommendations are acceptable in their country. These included three on valve bases and holders, two on wafer switches, two on jigs and pin straighteners, three on connectors and one on environmental testing.

The sub-committee strata has been reorganised to cover environmental testing of both electronic equipment and components, two sub-committees covering shock, bump and vibration tests with four working groups on corrosion tests, mould growth, solar radiation and dust effect tests. International standardisation of connectors for radio receivers and sound equipment moved into the final stages during the talks and countries will now have two months in which to suggest last alterations before release for publication.

First Meeting on Computers

The first meeting on computers and information processing was held during the talks, about 50 delegates from 11 countries taking part. Ten of the delegates were from the U.K. data processing industry and the terms of reference adopted were "to prepare international recommendations for electrical characteristics of computers and information process devices and systems, including process control computers, machine tool control computers and others as developed." Four sub-committees were formed to deal with output equipments, digital data transmission, analogue equipment in information processing systems and input-output media, respectively. The committee will operate in parallel with the companion ISO committee and will be closely associated with those IEC committees dealing with the electrical side of machine tools and other ISO committees on machine tools and office equipment.

Among the new documents which will soon be circulating around the National Committees—of which, of course, the BSI is one—will be revisions of tests for vibration fatigue, soldering, dry heat and vibration, these to form part of Publication 68, "Basic Climatic and Mechanical Robustness Testing Procedure for Components for Electrical Equipment," and eight documents concerned with electronic components, connectors and definitions for general requirements on printed wiring.

Electricity in tomorrow's homes

20 SOCKET-OUTLETS/DWELLING RECOMMENDED

MORE space, more heating and more extensive electrical installations are important requirements for tomorrow's housing. The official standards that apply today are set too low for the emerging pattern of living. That is the opinion of a sub-committee of the Ministry of Housing's Central Housing Advisory Committee whose report* was published last week. The sub-committee was appointed "to consider the standards of design and equipment applicable to family dwellings and other forms of residential accommodation, whether provided by public authorities or private enterprise." Evidence given by various bodies to the sub-committee was reported extensively in our columns during 1960.

Socket-outlets

An important feature of the present report is the sub-committee's endorsement of recommendations about more socket-outlets arrived at by the Building Research Station and published exclusively in the ELECTRICAL TIMES of 12 November, 1959.

The report notes that general practice about socket-outlets at present is to provide in a new dwelling the minimum number of outlets which the local electricity board will accept in exchange for free installation of supply cables. The Building Research Station conclusion was that in any house designed for five people, about 15 socket-outlets are required to meet reasonable present-day needs. Moreover, it was stressed that the location of the sockets is important—where there are only two sockets in a room (other than a double one) they should not be near one another, but preferably on opposite walls. The present report comments that the sub-committee found on visits, that in many dwellings, "the sockets have obviously been located with a view more to saving wire than with the aim of putting them in the place where they are most likely to be needed."

With the increase in the quantity of electrical equipment in use, the sub-committee recommend that 20 socket-outlets, some of which can be double socket-outlets, should be provided "whenever it can be afforded." They emphasise that 15 is an absolute minimum. Furthermore, they underline the desirability of arranging wiring so that it can conveniently service extra outlets found to be desirable in the future.

In this respect, the sub-committee emphasise that research is needed into methods of initial installation which will enable future outlets to be added at minimum cost and disturbance. Table 1 shows the sub-committee's levels of desirable and minimum socket-outlet provision, Table 2, the associated extra costs. They add that from a safety aspect, the installation as a whole should comply with the IEE Wiring Regulations and that meters and fuse boxes should be so placed that they are readily accessible.

* "Homes For Today and Tomorrow." HMSO, price 4s.

Heating

Of all the needs for improvement in housing standards, extra floor space is given priority, but provision of a higher standard of heating comes only narrowly second. The proposed minimum standard is a system capable of heating the kitchen and circulation areas to 55°F and living areas to 65°F when the outside temperature is 30°F. The committee comments that "it is time to recognise that a home without good heating is a home built to the standards of a bygone age. The nation has enough of those already."

Little information is thought to be widely available about the cost of providing and running good heating systems for houses. The report includes an extensive study of the cost aspect which covers solid fuel, gas and electrical thermal storage systems. Some of the results of the survey are shown in Table 3, in terms of the cost above present standards. However, the difficulty of arriving at broadly representative costs is emphasised in the report.

The cost estimates set out in Table 3 are based on amortisation over 60 years at 6% of the total capital cost of each heating system; £6 a year is allowed for replacements and servicing in oil installations and £2 a year for gas installations. Coke price is taken as 9s/cwt, oil as 1s 7d/gall, gas at 1s 4d/therm, plus 39s/quarter standing charge, and electricity at 0·8d/kWh off-peak (plus

Table 1. Desirable and Minimum Socket-outlet Provision

Part of Dwelling	Desirable Provision	Minimum Provision
Working area of kitchen	4	4
Dining area	2	1
Living area	5	3
First (or only) double bedroom	3	2
Other double bedrooms	2	2
Single bedrooms	2	2
Hall or landing	1	1
Store/workshop/garage	1	—
Total	20	15
Single study bedrooms	2	2
Single bed-sitting-rooms, family dwellings	3	3
Single bed-sitting-rooms, self-contained	5	5

Table 2. Estimated Extra Cost of Recommended Minimum Socket-outlet Provision

Type of Dwelling	Average Present Provision	New Minimum Provision	Estimated Extra Cost
2-storey house:			
5-person	6	15	£13
4-person	5	14	£13
Bungalow:			
2-person	4	10	£11
Flat:			
4-person	5	14	£13
2-person	4	10	£11
1-person	3	6	£6

Table 3. Space and Water Heating Costs for 5-person Terrace House, Ground Floor Only

Type of System	Annual Fuel Consumption	Annual Fuel Cost	Capital Cost —compared with basic system	Annual All-in Cost —compared with basic system
Independent boiler, 2 radiators and open fire:				
Coke boiler, open fire	46 cwt +20 cwt coke	£30	+ £71	+ £3
Oil boiler, open fire	325 gal oil + 20 cwt coke	£35	+£122	+£18
Gas boiler, open fire	470 therms gas + 20 cwt coke	£48	+ £68	+£23
Gas warm air, family home all time ..	620 therms	£49	+ £21	+£20
Gas warm air, family out most weekdays..	510 therms	£42	+ £21	+£13
Electric floor warming, radiant fire and off-peak storage water heating	9,200 kWh off-peak + 3,700 kWh on-peak	£51	− £12	+£17

10s/quarter rental of meter and time switch) and on-peak 1s 7d/kWh. In all cases, fuel cost allowed for the supply of 250 gall/wk of hot water at 140°F.

The basic system with which costs are compared is an open fire with a high output back-boiler and two radiators and estimated to use 73 cwt of coke a year, giving it an annual fuel cost of £33.

Where short period heating of two bedrooms for 25 hr a week is provided as well as heating for the ground floor and hot water, the capital costs for the two gas and one electric system shown in Table 3 increase to +£61, +£61, and +£12, respectively; and the all-in annual cost to +£25, +£17, and +£22, respectively.

In a qualitative estimate of the various types of central heating systems available, the sub-committee note that warm-air systems have the advantage of extreme flexibility and of providing the heat quickly where it is required. However, if the system is used intermittently the structure of the house is liable to get relatively cold. Hot water radiator systems are regarded as not quite as flexible and they have a slower response, although they can provide a more continuous background heat. Thermal storage systems are relatively inflexible but they provide a continuous supply of heat. A low temperature gradient between floor and ceiling is claimed, helping comfort conditions. Electrical under-floor heating is noted as the only thermal storage system in common domestic use when the report was prepared.

The report notes the wide possibilities of independent room heaters, especially as they are becoming more efficient; but it does not evaluate them.

Space in the Home

Space in the home affects electrical equipment, and the report lays stress on the need to provide more storage space for domestic appliances. The average provision made at present in local authority houses is just over 40 cu ft and 3 ft 6 in. of shelving, understandably condemned as "often inadequate." The committee's recommendation is for at least 80 cu ft of installed storage space in or adjacent to the kitchen for four- and five-person homes, and nearly as much for smaller ones.

On the general design of kitchens, the sub-committee recommend a continuous wall and floor space sufficient to provide the sequence: work surface/cooker/work surface/sink/work surface. This may be arranged in L or U shape, provided there is no break by a door or other traffic way. In adopting this recommendation from a Building Research Station study, the sub-committee suggest that a straight line arrangement requires uninterrupted wall surface of 12 ft 3 in. and the L shape uninterrupted wall surface 7 ft on one wall, plus 8 ft 9 in. on the adjoining wall. These figures are based on units 21 in. wide, and need modification if cookers and refrigerators wider than 21 in. are to be used.

It is felt that there is little strong demand for arrangements such as utility rooms separating household functions other than food preparation from the kitchen. Included in this relative rejection is the idea of using the bathroom as the room in which laundry is done, the washing machine being built in to remove electrical danger. Still on the subject of kitchens, the idea of a refrigerator which reduces the need for cupboard space is tacitly approved, and mention is made of the need to provide good lighting especially for the cooker, sink, and the interior of cupboards.

For flats, an increase in provision of lifts is suggested. One lift should be provided in buildings where the entrance is on the fourth storey or above, and two lifts if more than six storeys.

Measurements for Nuclear Studies

IN May of this year the International Atomic Energy Agency organised a conference on nuclear electronics in Belgrade. Last week the Measurement and Control section of the IEE, in conjunction with the British Nuclear Energy Conference, arranged a symposium on the same subject at which a report was given on papers presented at Belgrade, and information on corresponding British work was added.

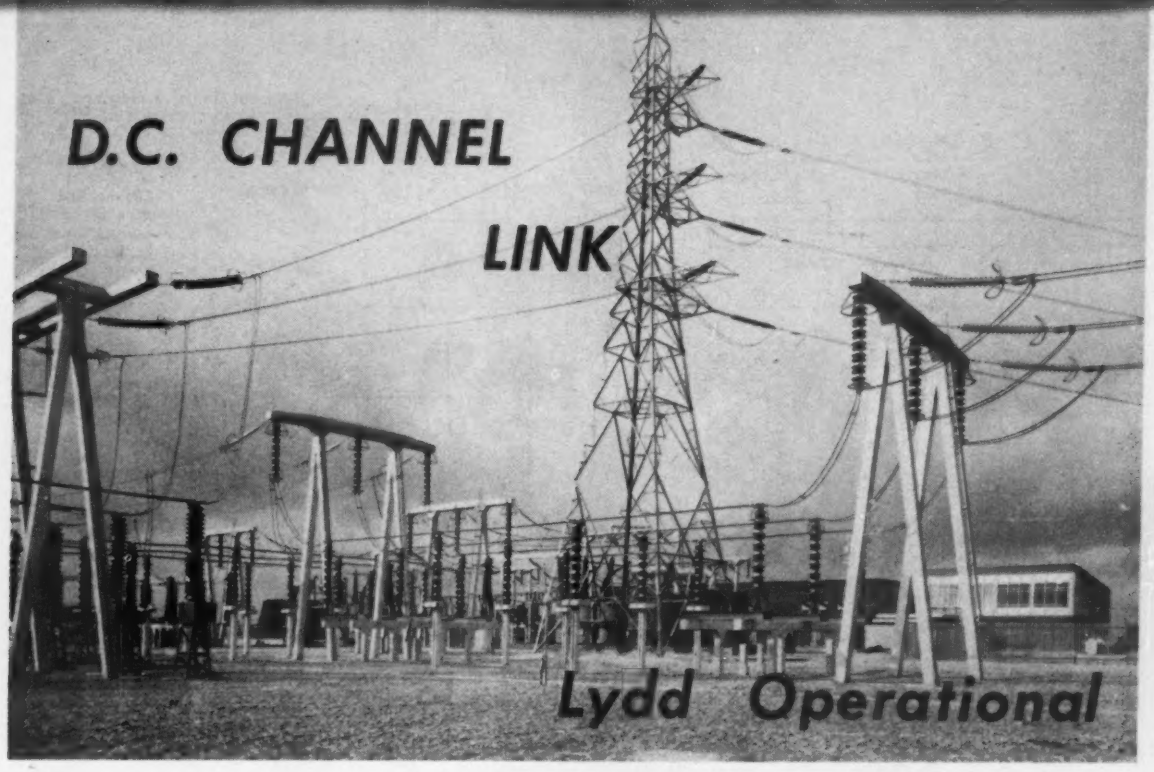
Much of the work described is far removed from the normal concern of the power engineer. For example, the opening paper, an account of the Belgrade report on radiation detectors, became concerned with the use of Cerenkov radiation measurement for the determination of particle velocities. This is a technique which involves measuring the Cerenkov angle, i.e., the angle between the particle path and the direction of emission of its associated Cerenkov radiation. It is said to be the only method applicable for accurate measurement of the velocity for particles travelling at speeds within 0·1% of the speed of light.

Of more direct importance to the electricity supply industry is the section of the symposium dealing with radiation monitors and instruments. A particularly difficult problem in this field is monitoring for plutonium. The physical and biological properties of plutonium are so undesirable that the permissible concentration in air is less than the normal background concentration of emissions from naturally occurring alpha emitters.

A possible change from the familiar film badge worn as a personal radiation monitor by those working with nuclear equipment is a device indicating dose rate as well as total dose. Such a device gives the operator a chance to take action when there is an increase in radiation. Described at the symposium "as Dr Borkowski's personal monitor," the new device is little larger than a fountain pen and can be carried in the pocket.

Indication of dose rate is given by flashes from a neon lamp and by audible "chirps" which have a repetition rate approximately proportional to dose between background level and a rate of 200 r/hr. The battery incorporated gives the instrument a life of 12 months. In this instrument, radiation is detected by a miniature geiger counter controlling the operation of an oscillator which produces the tone output and provides the h.v. supply.

D.C. CHANNEL LINK



A SIGNIFICANT ceremony in Anglo-French engineering co-operation will be celebrated tomorrow when the Minister of Power, the Rt. Hon. Richard Wood, inaugurates the cross-Channel cable power link. This ceremony will take place at the Thames South control centre of the CEGB at East Grinstead and it will be from there that power exchange between the two countries will be controlled in conjunction with a similar French control at Lille. The inauguration is to be televised by the BBC and by RTF at 11 a.m.

Choice of D.C.

The cross-Channel cable is designed to operate at ±100 kV to earth and to transport up to 160 MW in either direction. The original conception of the cross-Channel link, as discussed by the two countries in 1949, was based on a cable transmitting a.c. However, developments in high-voltage rectifying and converting equipment were such that by 1956 it was recognised that the advantages of a d.c. link could be obtained with an installation costing about £500,000 less than an a.c. scheme. The great advantage that the d.c. link has over its a.c. equivalent is that there is no longer need to synchronise the generating systems of the CEGB and EdeF. Corollary advantages are that no synchronising reactive power transfer is necessary or even possible between the two systems if a d.c. link is used and limitations on transmitting capability of the cable due to its capactive reactance are removed.

The a.c. system would require three cables each with the same cross-section as the two cables required for the d.c. link. In addition, losses on the a.c. system would be in excess of those with d.c. by about 9 MW.

The value of the link turns on first, the fact that electricity cannot be stored on a scale necessary for a power system, and secondly, that the hour-by-hour pattern of electricity demand in the two countries varies so that peak demands occur at different times. Excess generating capacity in one country can then be used to supply demand in the other country. The total output capacity of the CEGB is now 28,170 MW so that the link will only contribute a relatively small amount to this country's generating capacity, but even so, substantial economies are thought to be possible for both countries by exploiting the marginal generating capacity available at any given time to best advantage instead of using less efficient generating plant to meet peak demand. The saving in fuel cost alone has been estimated at £340,000/annum for both countries, partly because of savings possible by using more efficient plant but also by not having to start thermal plant frequently to meet peak demands.

Experience with the 160 MW link will show whether additional links are justifiable, but, that there is likely to be scope for a larger power interchange, is shown by estimates indicating that the difference between the generating capacity of one country and the maximum demand on it will soon be 800 MW to 1,000 MW at times when an equivalent surplus capacity is available in the other country.

Components of the Link

Essentially the scheme consists of two undersea cables, 34 miles long, linking converter stations at Lydd and Echingen, near Boulogne. At these substations, connections are made to the respective high-voltage grid systems, 225 kV in France and 275 kV in Great Britain.

The two British cables were laid in June this year and jointed in mid-channel to similar cables of French manufacture which had been laid earlier. The cables were described in ELECTRICAL TIMES for 1 June, 1960, and later that month, in 29 June issue, it was recorded that the cables had been successfully jointed by the French cable ship *Ampere*.

The two undersea cables have a cross-section of 0·525 sq in. They are connected to the Lydd substation through land cables about four miles long. Where the land cables pass through loam their cross-section has been increased to

Fig. 1. Above, general view of the Lydd converter substation with, in the foreground, part of the 275 kV switchyard

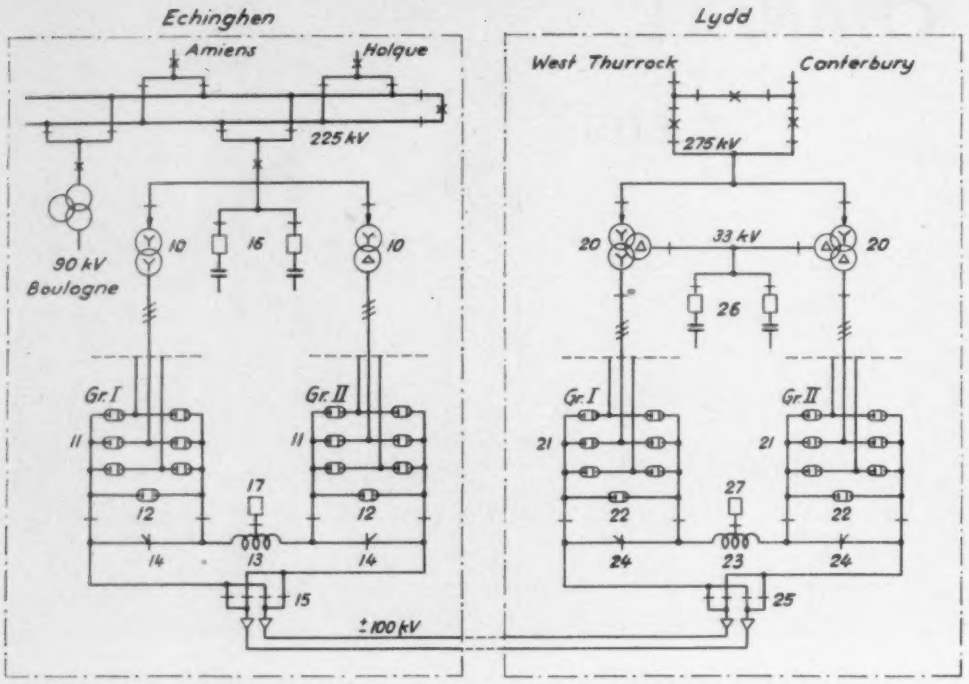


Fig. 2. Schematic of the cross-Channel link showing connections to the English and French systems.
10, 20. Converter transformers
11, 21. Six converter valves
12, 22. By-pass valve
13, 23. Smoothing reactors
14, 24. By-pass switches
15, 25 Cable isolators
16, 26. Damping and resonance filters
17, 27. Earthing impedances

0·6 sq in., while in the beach shingle, a cross-section of 0·925 sq in. was found to be necessary because of poor heat dissipation.

The cables terminate at insulators in the d.c. switchyard and are connected through overhead conductors to the converter substation. The substation is also linked through overhead conductors with the a.c. main rectifier transformers. These transformers have three windings, rated 95/95/65 MVA for voltages of 284/83·6/33 kV. The 33 kV tertiary winding is connected to a capacitor bank which provides reactive MVA for the converting plant. A description of the two rectifier transformers was given in ELECTRICAL TIMES for 22 June. These rectifier transformers are connected through the a.c. switchyard to the 275 kV double-circuit line which links the substation with Canterbury and West Thurrock.

Fig. 3. Front view of the 14 valve groups at Lydd. Above the four anode tubes are anode current equalising reactors and current surge suppressors. The common cathode compartment also contains auxiliaries. Both anode and cathode have semi-closed-circuit air circulation

Converting Equipment

Although the advantages of a d.c. submarine cable over an a.c. link with the same power throughput have been recognised for many years, its use was delayed by lack of sufficiently reliable converting equipment. Development work on high-power converting equipment was undertaken by the Swedish firm Asea before 1930. This firm was responsible for the 20 MW, 100 kV d.c. submarine link between the mainland and the island of Gotland, brought into service in 1954.

Design of the cross-Channel installation valves and those which will be used for the Cook Strait project in New Zealand has been directed by Dr U. Lamm, who has explained that one of the main difficulties in designing satisfactory valves is the complexity of behaviour of the ionised vapour which defies mathematical analysis. Satisfactory performance of the valves can only be proved under design conditions of both voltage and current. It is not possible to reduce testing time to less than several months because of the random occurrence of possible faults such as backfires. Co-operation in the development of these high-power valves was afforded by the Swedish Power Board State, who made available a large a.c. supply for their testing.

The French and British converter stations each contain 14 valves arranged in two groups of seven. Six valves in each group constitute a full wave bridge rectifier unit with grid control, while the seventh valve provides a by-pass if a fault occurs in the bridge.

Each valve is rated 100 kV, 800 A d.c. and consists of a cathode compartment with four anodes mounted above it. Meters in the front of the cathode compartment show the distribution of current between the anodes and the vacuum on the system. Since the complete valve system is insulated for 100 kV d.c. to earth by mounting it on insulators, these meters can be read from the valve hall gangway through a protective screen. The four anodes on each valve operate in parallel, correct current distribution between them being ensured by a reactor mounted above the valve. The main anodes are contained in vertical porcelain cylinders. These cylinders also house the

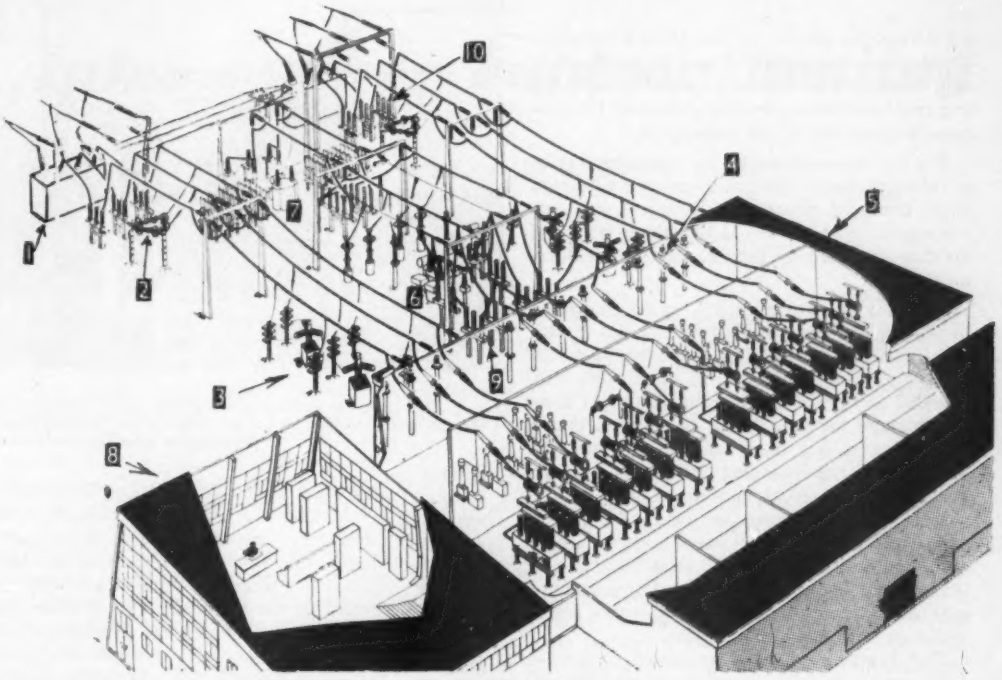


Fig. 4. Lydd substation layout

1. Converter transformers
2. Surge diverters
3. Converter valve damping equipment
4. Voltage measuring dividers
5. Converter hall
6. D.C. smoothing reactor
7. Harmonic damping reactor, damping capacitors and cable terminations
8. Control room
9. By-pass isolators
10. Isolators for a.c. side of converter group

control grid and the grading electrodes which ensure correct voltage distribution between the anodes and the cathode. The voltage distribution inside the anode cylinder is of vital importance and is controlled by resistance-capacitance networks, mounted outside the anode cylinder with connections made to electrodes sealed into the porcelain. The resistor-capacitor networks are so arranged that they can act as spark gaps if the voltage distribution becomes seriously disturbed. The cathode compartment is continually exhausted by a diffusion pump to a pressure of about 0·001 mm of Hg. This pump exhausts into a fore-tank which is in turn exhausted about once a week by mobile plant. In this way, loss of vacuum by materials released inside the valves is restricted.

The cathode compartment also contains the exciter and starting electrodes. These perform a similar function to those used in steel tank mercury-arc rectifiers.

Valve Ventilation

The temperature at which the valves operate is critical, and two air-cooling systems are provided. Air for the cathode is obtained from a common supply in the valve hall and delivered to each valve through glass-fibre tubes. The cathode tank temperature determines the mercury vapour pressure and has to be maintained within $\pm 10°C$ of the operating temperature. Air velocity is controlled by an electrically operated damper using a magnetic amplifier and a thermistor.

The anode cooling system removes the heat generated on load and also maintains the anodes above the tank temperature at low loads to ensure that mercury does not condense on the anode or grading electrodes. Air is circulated through glass-fibre tubes which surround the anode porcelain cylinders. The air circuit contains a fan and heater, automatically controlled and energised through insulating transformers to operate at 100 kV d.c. earth. A separate insulating transformer provides supplies for the valve grids.

Above each valve is mounted a cylindrical air-cored reactor whose function is to suppress surges caused by the stray capacitance of the converter installation.

Auxiliary Equipment

Inter-connection between the French 225 kV system and the 275 kV British supergrid is shown in Fig. 2, and Fig. 4 gives an impression of the equipment layout at Lydd.

The two 95 MVA rectifier transformers are connected star/star and star/delta and in this way the two converter groups operate together as a 12-phase unit, since the phase difference between the groups is 30° and each valve group consists of six valves. The rectifiers represent, to the a.c. system supplying them, an inductive load and to compensate for this load capacitors are installed. At Lydd the capacitor banks are connected to the tertiary windings of the rectifier transformers and operate at 33 kV. At the French substation the 50 MVAr compensating capacitors

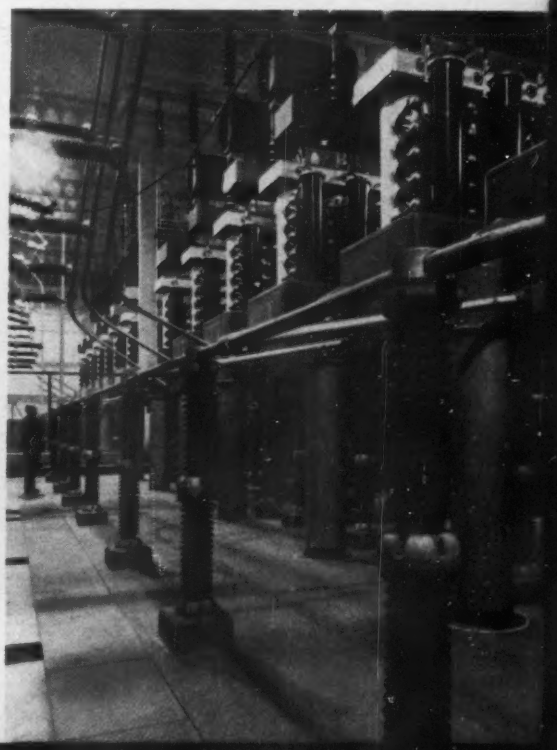


Fig. 5. Rear view of the converter valves, showing the aluminium busbars and the ventilation ducts for the cathodes. Voltage distribution is controlled by the resistor capacitor networks connected to the anode tubes

are connected directly to the 225 kV network. These capacitors also operate in conjunction with reactors and resistors to act as damping and resonant filters, absorbing most of the harmonics generated by the converters.

The a.c. connections to the converter valves are also coupled to the d.c. connections through valve damping circuits consisting of resistors and capacitors in series. High voltage potential dividers are fitted on the a.c. side for measurement.

The two valve groups are series connected through a d.c. reactor. This reactor has a midpoint available for earthing, but earthing would normally be done at one end of the link only to avoid any possibility of return currents flowing through the sea. It will be recalled that a sea return is not used for the Channel link because of the stringent Admiralty requirements to avoid errors in ship compass readings.

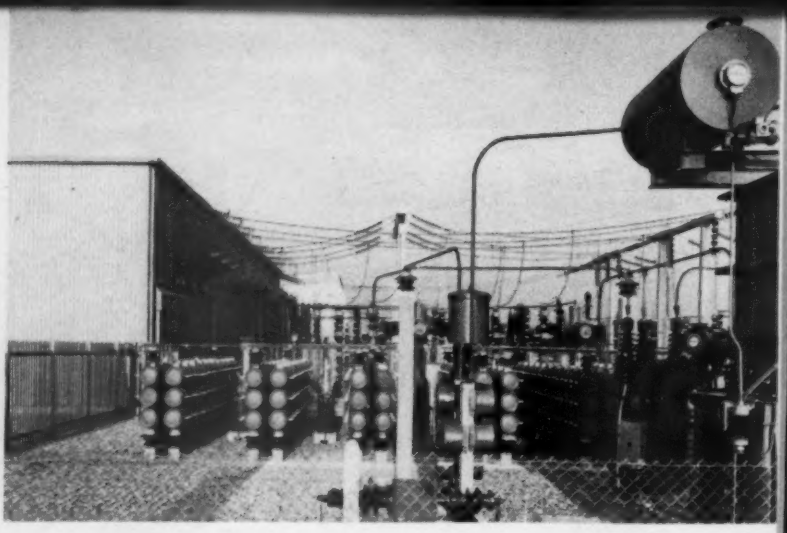


Fig. 6. The capacitor banks which, together with inductors, constitute the damping filter and resonance filter for the a.c. side and also provide reactive power necessary for converter operation

Isolators are inserted in the d.c. connection from the converters to enable the cable ends or the d.c. reactance circuit to be isolated, or the cable polarity reversed. There is also a d.c. damping circuit connected across the d.c. poles with centre point earthed and lightning arresters are provided on both a.c. and d.c. sides.

The function of the suppression circuits is to prevent radio and television interference as well as suppressing undesirable harmonics in the a.c. connections. Interference is also reduced by enclosing the complete valve hall in a Faraday cage of metal mesh in the building structure.

Operation

Power flow through the link can be controlled by adjusting taps on the rectifier transformers or by grid control on the valve groups. A combination of these methods is used. If power is being transmitted from England to France, the Lydd station converters will operate as rectifiers and the French converters as inverters. How much power is to be transferred would be decided by the control centres at East Grinstead for the CEGB and at Lille for E de F. With the Lydd substation transmitting, control of all the equipment in the link would be from Lydd. The function of the French inverter installation would then be concentrated on maintaining constant voltage at the receiving end, any variation in the French network voltage being compensated for by tap changing on the rectifier transformers. With a constant voltage maintained at the receiving end, power flow through the link will depend only on the amount by which the d.c. voltage at Lydd exceeds that at Echingen. This voltage would be automatically controlled using, in the main, grid control on the valves to maintain the power transmitted at the predetermined value. Any desired change in the power flow is obtained by the operator simply turning a control handle. The necessary changes in settings are then automatically performed by the equipment and, if these require a change in the French equipment, the information is telemetered.

The link, therefore, operates essentially with constant voltage and power, but overriding current control is provided for protection. If a fault develops in one of the converter valves there will be unbalance between the anode currents of any particular valve, or the power on the valve group d.c. side will differ from that on the a.c. side. Under these conditions, the protective equipment will cause one complete valve group to be by-passed through the seventh valve on each group. In consequence, if the cable was operating at 200 kV between poles, the voltage would fall to 100 kV. When the receiving end senses so large a change in voltage, the tap-changing equipment and valve grid potentials will be altered accordingly to reduce the converter voltage. Until this is reduced, the inverter group blocks and power transmission through the cable ceases. If the fault clears rapidly, as would generally be the case, the grid of the by-pass valve would block and the rectifier group in which the fault occurred would be reinstated. If, however, the fault persisted for more than a few cycles, the by-pass valve would itself be by-passed by an isolator, and the sending equipment would continue to operate with one valve group but at reduced power.

Provided the necessary preliminary arrangements have been made between French and British control rooms, the change from power import to export can be made automatically from either end of the cable. At a recent demonstration of the equipment, 80 MW was being imported from France, and this was changed to 80 MW export in 90 sec. The controller set the required level by a handwheel. Power import was then reduced automatically in steps until, between 0 MW and 8 MW, the Lydd converters blocked. The converters in France then blocked automatically, following information telemetered across the Channel from Lydd. Isolators then reversed converter polarity without reversing the cable polarity, the Lydd isolators first, followed by those at Echingen. With the isolators reversed, the converter equipments unblocked and the load was increased in steps to the value preset by the controller. In an emergency, it would be possible to reverse the power flow in 3 sec by reversing the cable polarity, but this is undesirable.

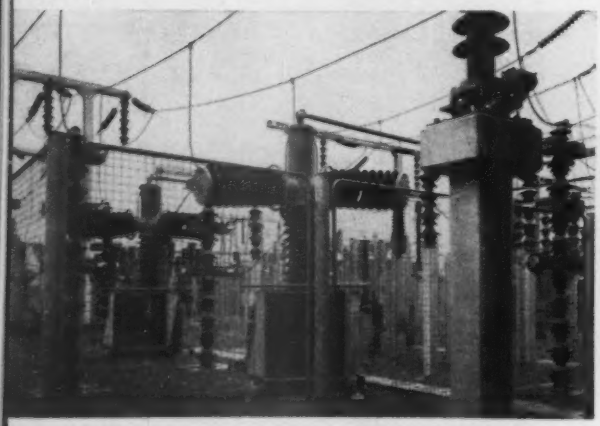


Fig. 7. Part of the converter damping equipment consisting of resistors and capacitors. One star-shaped, oil-cooled resistor unit is connected to each d.c. pole

Principal contractors: **Converter equipment, Asea, Vasteras, Sweden. Rectifier transformers, Fuller Electric. Cables (British), AEI (Woolwich) Ltd. BICC Ltd. 275 kV outdoor substation and switchgear, A. Reyrolle. Civil engineering works Richard Costain, Ventilating plant Matthew Hall.**

Infra-red for outdoor heating

KEEPING SPORTS FANS WARM IN WINTER

by R. J. Francis, F.R.S.A.

THE heating of stadiums and other large areas involving high heat losses has always presented a problem to the heating engineer and, with the present-day cost of fuels, it is an even greater problem to heat this type of building economically. Is there, indeed, any method of providing heat to occupants at a fair and reasonable cost, in view of the fact that many of these buildings are only occupied for relatively short periods of time? "Reasonable cost" implies not only capital costs but also running costs.

There is a satisfactory and economic answer to this problem. It lies in the use of an infra-red heating system, incorporating high-efficiency radiators operating at the correct wavelength and able to be used from heights varying from 8 ft to 25 ft above floor level.

Nature provides us with our own heating system by burning up the carbon within our body and so producing heat, which is lost more rapidly as the surrounding conditions become cooler. Most people think only in terms of an actual rise in air temperature for them to feel warm, but is this really the case? Let us, however, examine for a moment conditions which many people have experienced in Switzerland. Air temperature there can be below freezing, yet one can be perfectly comfortable, even in a swimsuit, provided one is receiving the solar radiation. It is, therefore, not absolutely necessary to raise the air temperature within a building in order to achieve comfort conditions. We can introduce into a building or a given area similar heat to that emitted by the sun; that is, radiation at a wavelength of 2 microns to 4 microns, peaking at 3 microns, which is the point at which the human body is most receptive to radiant energy. By this means, we can slow down the outward loss of heat from the body by direct irradiation, irrespective of the air temperature.

Double Effect

We do have another factor to contend with, however, and that is the cold mean radiant effect originating from walls, stone or concrete floors, where the total mass is at a very low temperature. This will "transmit" itself to a body or bodies within a building and it can have a noticeable effect, even although the air temperature within that building is quite high.

A typical instance of these conditions is in a railway carriage during the winter months, when external temperatures are low. Although the air temperature in the carriage can be between 75°F and 80°F, and often is, passengers can feel that side of their body adjacent to the window to be extremely cold. In heating a building by infra-red radiation, then, we have to achieve a double effect: applying heat direct to the body by direct effect from the infra-red units in question, and also raising the building temperature by the use of pre-heating periods. These periods may vary between 30 min and 90 min, depending on the building construction and the state of the fabric.

Useful Heat

Infra-red radiation is a term given to heat falling within the infra-red band of the spectrum. By selecting a wavelength peaking at 3 microns and between the waveband of 2 microns to 4 microns, over 92% of the energy produced by the equipment is transmitted forward in the form of useful heat. This energy can be transmitted through the atmosphere without becoming absorbed, but upon striking a solid object the heat is usefully collected and the secondary effect of raising the air temperature occurs. Air movement does not affect the heat emitted from a 3 micron infra-red radiator. The use of such devices, therefore, is ideal in circumstances where it would be uneconomic or impossible to heat the total volume of air or where the air movement is so great that any convected heat currents produced would be rapidly dissipated. Another application occurs where heat is required quickly and for short periods of time.

Although the amount of radiation generated will vary with the emitting substance, the wavelength of the radiation is dependent only upon its temperature. According to their wavelength, electro-magnetic radiations produce differing effects, the whole spectrum ranging from the shortest gamma rays to the longwave radio waves. For heating, only that part of the spectrum covering the light and infra-red rays need be considered (it is estimated that 46% of the sun's energy is given off in the form of light and 43% in the form of heat). These wavelengths are measured in Angstrom units and microns (10,000 Angstrom

* Mr Francis is manager, Infra-red Division, Thermodare (Great Britain).

Fig. 1. Infra-red heaters installed at Lambert's Garage, Kingston upon Thames

Fig. 2. Taken on an infra-red sensitive film in the dark, this photograph gives a visual impression of the heat distribution achieved at Shawfields Stadium, Rutherglen. Details of the installation of infra-red heaters are shown in Fig. 3. The left-hand row of "lights" in the picture above are 4,000 W heaters, the next row 3,000 W heaters and those just seen right 800 W.

units=1 micron, and 1,000 microns=1 centimetre). The light range extends from the violet at 3,950 Angstrom units to red at 7,661 Angstrom units; the infra-red range extends beyond this to about 420 microns, but for heating purposes wavelengths in the range 0·75 microns to 12 microns are employed.

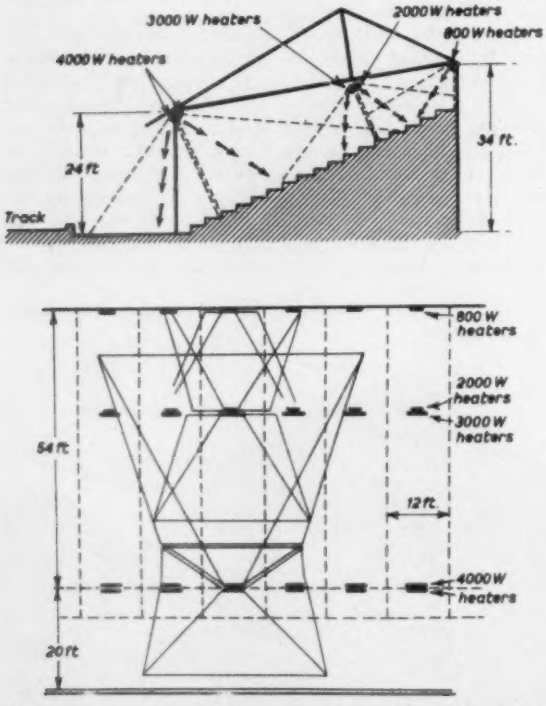


Fig. 3. Thermodare 3 micron infra-red heating at Shawfields Stadium, Rutherglen. Top: section of stand, showing angle of irradiation from heaters. Immediately above: plan of part of 228 ft long stand, showing area of irradiation from one bank of heaters

Broad Frequency

It is not possible for a body, other than a hollow-spaced black body, to obtain 100% absorption over the full wavelength, and the radiator must be designed to operate over the absorption wavelength of the substances to be heated. With infra-red radiation, a broad frequency band is generated with peaks becoming more definite as the temperature of the radiator—and hence the frequency—is increased. At radiator temperatures between 300°C and 1,000°C, the radiated wavelength is mostly in the long-wave, infra-red range. Water has a maximum absorption of radiant energy at 2·7 microns wavelength and, since the human body contains a high percentage of water, it will absorb the maximum of heat at that wavelength.

Lagging Behind

Many readers travelling on the Continent will have experienced this type of heating installation in outdoor cafés, bus shelters, cinemas and theatres. We in this country are lagging considerably behind our neighbours in Holland, France and Germany, but we are using these systems externally for the heating of shopping arcades, semi-enclosed markets, factory loading bays, cinemas and theatre foyers. The potential of these external applications is quite enormous. There are already a number of corporations interested in the application of infra-red heating for the external surround of swimming-pools, particularly in the case of seaside resorts, where the outdoor cafeteria system is employed. Not only is this a means of providing comfort to the clientele of such establishments but it also enables the period of occupancy to be extended well into the evening when normally, even on some summer days, unless the weather is particularly warm, there is a noticeable fall-off in attendance from seven o'clock onwards.

The current football season sees several clubs' stadiums and enclosures heated by this method. This will be an all-out effort on behalf of their managements to combat the falling-off in attendance which is causing the clubs a considerable loss in revenue.

With the general public daily becoming more conscious of the need for adequate heating in all circumstances, irrespective of the type of location, heating by infra-red radiation is gaining ever-increasing popularity during both leisure and working hours.

SNAP IN COLOUR

As part of the wider research programme on space vehicles, a move to develop long-life power sources has been concentrated in a government-sponsored development programme, SNAP (Secondary Nuclear Auxiliary Power), in the USA. Over the past five years a number of devices have been developed ranging from the 4 lb Snap III generating some 3 W of power and using Po210 as the radioactive source to some of the latest in development which are expected to develop 30 kW with a life of several years.

Films of tests to destruction of SNAP devices have now been released for public display by the US Atomic Energy Commission and can be obtained on loan from the American Embassy, London. There are three, all 16 mm, and they are entitled: "Nuclear Reactors for Space" (17 min), "Our Nearest Star" (12 min), and "SNAP III Operational Tests" (18 min).

AROUND THE TRADE

BY PEREGRIN

CHILL November failed "to bring the blast" and fire sales have been brighter than expected. Sales of small appliances are speeding up with the Christmas rush, but electric blankets remain dull; it needs two or three icy nights to stir the public into buying—but in spite of the publicity given to their fire-raising propensities they do still sell without question. It is strange, that! Either the public do not read such items in the news or they have implicit faith in their own karma—or their dealers!

Area Board Trading

I have been having another look through the Electricity Boards' accounts and reports for 1960-61. The area reports make very interesting reading and it is obvious that no stone is left unturned to further sales, and equally obvious that there are holes somewhere in the bucket when one considers the relation of "estimated surplus" (the word profit is evidently "out") to the total turnover. I notice the drop of over £625,000 in sales is blamed on hire-purchase and credit restrictions—maybe overbuying at low terms the previous year, and a real necessity for applying the brake, had nothing to do with it! There is not a word about competition from gas, oil or coal, or even the prospect of electricity from atomic energy on tap.

Of the area reports I would select the Midlands as the most prosperous district industrially. This has, apparently, more than 170 shops and mobile showrooms, which achieved some £8 million in wiring and sale of appliances and, incidentally, a drop of £500/shop/month from the previous year. Their "estimated surplus" is just over £250,000 which is, roughly, a profit of 3%. Most retailers would consider this a very small return for the hard team work, varied publicity, and constant, careful staff training. I cannot find any definite figure in the accounts for bad debts and, although I realise that some idea of supply cut-off helps to keep board customers paying, I still feel that the boards must have a great increase in that figure—as, indeed, most of us have over the last year or so. In the main, I think electrical contractors are in closer contact with their own district engineers than the heads of both sides appreciate—this is all to the good—but there is room for more co-operation, and it would be of the greatest benefit to all concerned if this co-operation were extended, became more open. At the moment, publicity badly needs attention if we are to compete with the oil industry, but the electricity authorities forget that the contractors are helping to increase their generating load, while the oil industry works hand-in-hand with all its dealers. EDA at the moment is a bottle-neck. It produces first-class material, but this is not fully available to electrical contractors and electrical retailers. All hands to the pump is surely the slogan for just now—if the pump is to be electrical, not oil.

I mentioned staff training as an essential of the boards' programmes, and I have often envied them their facilities and organisations towards this end. Now that NECTA are waking up, I feel much happier about this position and hope that in good time we shall see a training establishment for our members and their staffs run on similar lines. A sales conference for retailers is already on the anvil for February, 1962, and I take this as an indication that the ordinary NECTA members realise that retailing requires lots of study and practice to achieve moderate success. Well trained and organised, the retailer can give excellent service to the public, but this fact must be kept very much in the public eye in these days, when goodwill no longer seems to count and great forces threaten price maintenance. Incidentally, it puzzles me that where a definite wage policy seems to be an integral part of our national life, the retailer's wages should be so threatened. Apparently, the labourer is no longer worthy of his hire when he dares to till his own ground. Over the past 12 months much has been done for retailers by the appointment of Mr Dennis Jones as sales training officer, training courses, brochures and booklets, all with a live committee in charge, and now there is the prospect of co-operation with the RTRA. This is an excellent idea, and I hope that sincere effort will accomplish what has seemed impossible in the past. It only remains now for each individual retailer to be aware of his needs, his shortcomings and his duty to himself, his staff, the public and his fellow-members to make what has been done worth while and ensure future progress and success. And that is the hardest nut of all to crack!

Direct Selling

I was astonished to hear that the Colston organisation were linking up with the Rolls Company for direct-to-the-public sales of washing machines and dishwashers, with the promised opening of a discount shop in January, 1962, and five more to follow later in the year. At least they will now learn something of local rates, property values, rents, etc., and maybe some of the other burdens of the retailer, which the direct-to-the-public manufacturer escapes. But perhaps their registered retailers might be advised to take a second look at their agreements and value their present stocks with the new selling price of 49 gn, against the old selling price of 95 gn. With £13 15s 11d purchase tax and £18 17s 3d representing the retailer's margin, the price difference wants some explaining. Perhaps a more realistic selling price right from the time the machine was introduced might have helped to keep up the level of sales. Dishwasher sales are not being made to smaller households who could well benefit by them because the price is much too high for an article which only does part of the job. Those who could well afford the high price think it a poor investment for washing two or three "covers" when the pie dish and the saucepan still have to be done by hand. I regret to say that my own stands idle in its corner for 95% of the time, while my kitchen comptroller dabbles in the latest kiss-the-hand cleanser.

I must acknowledge Miss George's very kind letter regarding the activities of the EAW, and I appreciate her explanation and applaud the subject of her campaign. I still have not seen the "Electrical Viewpoint" report, but I will make it my business to get hold of one immediately. More co-operation between boards and contractors might also include the EAW, with advantage to all.

Personalities *in the industry*

Dr J. R. Mortlock

Mr D. H. Kendon

Mr D. G. Dodds

Mr N. F. Marsh

Mr P. Etchells

Dr J. R. Mortlock, B.SC.(ENG.), M.I.E.E., MEM.A.I.E.E., has been appointed chief engineer (engineering services), AEI (Manchester) Ltd., but retains his position as chief engineer, AEI Systems Engineering Department. Well known for his work on power system analysis, Dr Mortlock started with the BTH Co. as a student apprentice and in 1928 became tender engineer at the Willesden switchgear factory. He was appointed assistant to the superintendent engineer in 1931, manager of the Power Systems Engineering Department in 1945, and chief engineer of the AEI Systems Engineering Department in 1958. A frequent contributor to the pages of the ELECTRICAL TIMES, Dr Mortlock is also author of two books on a.c. switchgear, and on power system analysis (jointly with Prof Humphrey-Davies). He served on the IEE Council from 1957 until early this year, and was chairman of the Supply Section in 1959.

Mr Frank H. Farthing, who recently retired from the General Electric Co. Ltd. after 44 years' service, has been appointed southern agent for Gatehill Beco Ltd.

Sir Christopher Hinton has been elected chairman-designate of the International Executive Council of the British National Committee, World Power Conference. This was agreed upon after **Sir Vincent de Ferranti** announced that he would not be a candidate for the post when his present term of office expires in October, 1962.

First assistant district engineer at Luton, **Mr P. Etchells,** A.M.C.T., A.M.I.E.E., has been appointed engineer of the Watford district of the Eastern Electricity Board. He succeeds **Mr A. Barraclough,** A.M.I.E.E., who is transferring to the Chilterns sub-area staff on operational research duties as from 1 Jan. next (*ESH, page 106). Mr Etchells joined the Eastern Electricity Board in 1954 as third assistant engineer at Luton and has been first assistant district engineer in that district since December, 1958. Earlier he had held various positions with the North Western and South Eastern Electricity Boards. He is also a member of the Eastern Board's apprentice training board and serves on the engineering advisory committee of the Luton College of Technology. Mr Barraclough has been district engineer at Watford for some time. Prior to nationalisation of the industry he was mains engineer with the Bedford Corporation undertaking, following service with Pirelli-General Cable Works Ltd., the Macintosh Cable Co. and BTH Co.

Mr H. F. Chastney has been appointed Regional personnel officer to the South Eastern Region of the CEGB. For the

Changes in Board Chairmen

The Minister of Power has appointed **Mr Nevill Marsh,** M.A., M.I.E.E., chairman of the East Midlands Electricity Board, to be a deputy chairman of the Electricity Council with effect from 1 Jan., 1962, and **Mr D. G. Dodds,** LL.B., is to succeed **Mr D. H. Kendon,** C.B.E., B.SC., M.I.E.E., M.I.MECH.E., as chairman of the Merseyside and North Wales Electricity Board on the latter's retirement on 8 February next at the age of 66 (*ESH, pages 45, 113, 135).

Mr Nevill Marsh, who was one of three area electricity board chairmen among 11 members of the management side of the NJIC Negotiating Committee which recently awarded the pay rise to manual workers in the industry, was deputy chairman of the East Midlands Board from 1957 to 1959, after a two-year period in a similar capacity with the North Eastern Electricity Board. Earlier, he had been chief commercial officer to the East Midlands Board from vesting day until 1955. Educated at Oundle School and Cambridge University, Mr Marsh has been associated with the electricity supply industry for 29 years, having started with the Mid-Lincs Electric Supply Co. after two years' post-graduate training with Metropolitan-Vickers. He was engineer and manager of the Mid-Lincs Co. from 1938 to 1948.

Mr Dodds, whose new appointment to MANWEB is for a period of five years, has been the Board's deputy chairman since January, 1960 (*ESH, page 135). Prior to that Mr Dodds was industrial relations adviser of the Electricity Council from 1957, and chief industrial relations officer to the CEA. He entered the electricity supply industry in 1948 as secretary and solicitor to the South Wales Electricity Board, a post he held until 1956. Earlier he was deputy town clerk of Cardiff for two years. Educated at Rutherford College and at King's College, Durham University, he graduated in Laws at London University. He was admitted as a solicitor in 1936, and from then until 1941 held appointments as assistant solicitor and senior assistant solicitor to Gateshead Corporation. From 1941 to 1945 he served in the Royal Navy and was commissioned in the RNVR. Mr Kendon was deputy chairman of the Midlands Electricity Board from 1948 to 1954 when he went to Manweb, and prior to nationalisation of the industry was general manager of Edmundson's largest subsidiary, the Shropshire, Worcestershire and Staffordshire Electric Power Co., for nine years, following four years as general manager of the Cornwall Electric Power Co. He began his career in the industry with Tilling Stevens Ltd., and joined the Edmundson's group in 1921. Among his early tasks was the supervision of major changeover work from d.c. to a.c.

**Denotes revision to the "Electricity Supply Handbook, 1961."*

past six months he has been acting assistant Regional secretary (personnel). After ten years with the St. James's and Pall Mall Electric Light Co. Ltd., and the Central Electric Supply Co. Ltd., Mr Chastney joined the London Power Co. Ltd. in 1927. He remained with them until his appointment as establishment officer to the London Division in 1948. He became deputy divisional secretary in 1950 and personnel officer in 1959 (*ESH, page 54).

Mr P. V. Walker joined the General Electric Co. Ltd. as chief methods accountant on 1 Dec. He was previously with the Mobil Oil Co.

Formerly chief accountant with A. V. Roe and Co., **Mr R. Fitch,** A.C.A., has joine.l Lancashire Dynamo and Crypto as chief accountant at the Trafford Pk works.

Chief accountant of Brookhirst Igranic, **Mr R. Cutler** has been given the additional appointment of company secretary following the resignation of **Mr N. Clark.** Mr Cutler joined the company in 1957, after being chief cost accountant and budget officer with Petters Ltd.

Mr D. M. Paterson, B.SC.(HONS.), has been appointed assistant superintendent, Large Industrial Machines Department, AEI Motor and Control Gear Division. He joined Metropolitan-Vickers in 1954 as a graduate apprentice, and after service in the Royal Navy returned to the company in 1958 as a junior engineer in the Outside Erection Department. In the summer of this year he was made temporary assistant to the superintendent of the Plant Department at the AEI Trafford Pk works.

Mr G. A. Baker, area manager in Liverpool to Sangamo Weston Ltd., has been elected hon. secretary of the Mersey and North Wales district of the Electrical Industries National Golf Committee, in succession to **Mr R. Gee,** of AEI.

Sales manager of the Telephone Manufacturing Co.'s Transmission Division, **Mr D. H. Maxwell** has just returned from an extensive tour of the Middle and Far East.

Mr W. Titmuss, A.M.BRIT.I.R.E., M.S.M.A., has joined International Rectifier Co. (Gt. Britain) Ltd. He was previously a member of the board of directors of a company of industrial consultants, and has been closely associated with electronic and electrical equipment manufacturers and users for many years. He will be responsible for marketing a wide range of semiconductor devices, including heavy duty rectifiers for the power industry.

On his retirement after 13 years as commercial officer of the Derby and Burton area of the East Midlands Electricity Board, **Mr H. L. Jones,** M.I.E.E., A.M.C.T., was recently presented with a set of stainless steel cutlery from his colleagues, and a gold wrist-watch from the Board. His successor is **Mr W. L. Bentley,** A.M.I.E.E., as we have already reported (*ESH, page 117).

Mr C. F. Ellis has joined Ultra Electronics Ltd. as sales engineer to the Control and Instrumentation Group, and will be primarily concerned with the expansion of activities in nuclear and industrial fields. He was previously with AEI Radio and Electronics Components Sales Division.

Viscount Chandos, chairman of AEI Ltd., is to vacate the presidency of Manchester College of Science and Technology, which he has held since 1956. His successor will be **Sir John Cockcroft.**

Telefusion Ltd. announce the appointment of **Mr A. E. Rolfe** as manager of the Relay Division and **Mr J. C. Boothby** as technical officer to that Division.

Mr J. McCrea has been appointed a director of the Dubilier Condenser Co. (1925) Ltd. in addition to his duties as manager of the Kirkby factory of the company. **Mr F. G. Berger** has been appointed a director of the company in addition to his duties as production control manager at the Acton factory.

Two senior appointments have been made in the English Electric Co.'s Aircraft Equipment Division, Bradford. **Mr E. B. Lynch,** A.M.I.E.E., who has been chief service engineer, becomes chief sales engineer, and the former position is taken over by **Mr C. T. Leeson.** Mr Lynch was a designer of voltage regulators with Newton Brothers (Derby)

Sir Ronald Nesbitt-Hawes, principal of the English Electric Co's Staff Training College at Dunchurch Lodge since 1959, is to retire at the end of this year. Our picture above shows Mr G. S. Bosworth, left, director of group personnel services, presenting him with a pair of gold cufflinks, the gift of colleagues, to mark his forthcoming retirement

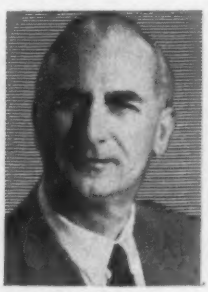
Ltd. before joining English Electric in 1956. Mr Leeson joined the Division as a senior service engineer in 1958 and has been responsible for technical and commercial liaison work between the company and civil airline operators using constant frequency generating systems and other specialised equipment, and with aircraft constructors in southern England. He will now be in charge of the general administration of the Division's Service Department.

Prof F. C. Williams, C.B.E., professor of electrical engineering at the University of Manchester, has been elected as a member of the Council of the Royal Society.

Thorn Electrical Industries Ltd. announce that **Mr G. D. Sparrow,** M.I.PROD.E., general manager of their Mechanical and Works Engineering Departments, has been appointed to the board of Atlas Lighting Ltd. Mr Sparrow has, since 1947, been responsible for providing the TEI Group's special purpose automatic machinery requirements and is also a director of another Thorn subsidiary, Manifold Machinery Ltd.

Mr I. L. Hartin has joined Permanoid Ltd. as branch manager at Wolverhampton, where he will also represent the associated company, Arrell Electrical Accessories Ltd. After being educated at the Wolverhampton and Staffordshire Technical College, Mr Hartin began his career in the electrical industry as an assistant commercial engineer in the Leominster district of the Midlands Electricity Board. He later joined the General Electric Co.'s sales organisation attached to the

Mr D. M. Paterson



Mr W. Titmuss

Mr E. B. Lynch

Mr G. D. Sparrow

firm's Midlands branch in Birmingham.

Previously with Electrolux Ltd., **Mr O. J. Broady** has joined Ekco Heating and Electrical Ltd. as technical representative covering the Eastern Counties, succeeding **Mr G. E. Lewis** who has been transferred to the London area.

Assistant superintendent of the Large Turbine Department at the AEI Trafford Park Works, **Mr T. Wightman** retired on 30 Nov., after 37 years' service. From his colleagues and friends in the works he received many gifts to mark his retirement, including a TV set, an electric drill and a silver-plated scale model of a 120 MW turbine.

One of the founders of Fluidrive Engineering Co. Ltd. for over 30 years, **Mr A. Vickers** will become a non-executive director as from 1 Jan. next, but will continue to devote part of his time to the affairs of the company.

Mr H. Gardiner has joined Arco Rewinds as manager of their Contracting Department, where he will be responsible for providing plans and drawings for complete wiring installations of factories and other buildings. Mr Gardiner has had ten years' contracting experience with his own company in Northern Ireland and joins Arco from another Birmingham electrical engineering concern.

Public relations officer to the Eire Electricity Supply Board since 1928, **Mr E. A. Lawler** was the recipient of many presentations at a dinner given in his honour in Dublin to mark his retirement. Replying to many warm tributes, Mr Lawler said his appointment as the country's first public relations officer was due to Dr T. McLoughlin, the man responsible for the national electrification, who brought back the idea of setting up a Public Relations Department after a visit to America in 1927.

Mr P. A. Cartwright, M.SC., M.B.I.M., M.INST.W.S., A.I.M., A.I.PROD.E., formerly with Wilmot Breeden Ltd., has joined the Round Oak Steel Works Ltd. as works study and operational research manager.

District commercial engineer of the Neath district of the South Wales Electricity Board since March, 1959, **Mr F. E. Walker,** A.M.I.E.E., has been appointed manager of the Pontypridd and Caerphilly district (*ESH, pages 131-32). Mr Walker, whose new appointment takes effect from 1 Jan. next, succeeds **Mr A. C. Davies,** A.M.I.E.E., who has transferred to the Rhondda district as manager. He commenced his training with the Finchley Borough Council's Electricity Department in 1941 and, after war service, was with the Eastern Electricity Board until 1954 when he joined the South Eastern Board as assistant district engineer in the Mid-Sussex district. In July, 1957, he went to South Wales as first assistant district engineer at Neath.

Mr F. W. Tomlinson, M.A., M.I.E.E., managing director of Pyrotenax Ltd., has been appointed chairman of the company in addition to his present duties. He succeeds **Sir Brograve Beauchamp,** who has resigned from the chairmanship after completing 25 years' service in that capacity.

Mr J. F. Towell has this week taken up duties as resident engineer for Babcock and Wilcox Ltd. at Sizewell nuclear power station, Suffolk. Since 1960 he has been engaged on programming the company's work at Trawsfynydd nuclear power station.

Under a reorganisation of the Sales Department of Thomas Bolton and Sons Ltd., **Mr J. G. R. Warburton** will be transferred from Widnes to the Froghall Works, Staffs, to take charge of the new Sales Department as from 1 Jan. From the same date **Mr A. R. D. Kitson** will take up duties as London sales manager, operating from 118 Regent St, W.1.

OBITUARY

Mr J. Towell, ASSOCIATE I.E.E., sales engineer, AEI Electronic Apparatus Division, New Parks, Leicester, died on 29 Nov., aged 58.

NEW LITERATURE

British Railways Electrification Conference Proceedings

AN event of more than usual historical significance was the Conference organised by British Railways in October, 1960, when British manufacturers were very open about the designs of equipment they had developed for the momentous electrification programme at the hitherto unused dual-voltage system at 25 kV and 6·25 kV, 50 c/s, single-phase. Among those who were present and contributed to the subsequent discussion were eminent engineers from the Continent, the USA and even Japan. The whole of the papers and illustrations have been bound, together with a record of the discussions, into a single volume which must be unique in railway history. As we know, certain difficulties were experienced subsequent to the conference and a reference is made to this in the final appendix but these, too, are now a matter of history. For all who are interested in railway matters and the younger generation planning to become railway engineers, this volume is, despite the cost, well worth having. Published by the British Transport Commission, 496 pages, 9¼ in. by 8 in. 120 photographs and 175 diagrams. Price £5.

Atlas Lighting Manual

PREPARED in loose-leaf form, bound in a black plastics cover, this manual has been devised for the use of architects, students and others who wish to have more than just a cursory knowledge of lighting technology. It comprises 16 chapters, each on a particular aspect of lighting science and written by specialists who are mainly on the technical staff of Atlas Lighting Ltd. H. C. Weston, O.B.E., F.I.E.S., consultant to the company, and H. Hewitt, M.I.E.E., F.I.E.S., are the joint editors. An appendix of just over 100 pages lists special data of Atlas lamps, fittings and control gear and includes, in the case of fittings, the glare index in accordance with the recent IES Code recommendations.

The technical content is of a high standard, comprehensive and well presented, but it might have been preferable—and would certainly have been more economic—to have had the manual bound in the conventional manner with the appendix as a separate supplement. A second edition may, however, appear in this form. A particularly interesting feature is an outstanding colour presentation of the CIE chromaticity chart. Published by Atlas Lighting Ltd., Thorn Hse, London W.C.1, 313 pages, 8½ in. by 6½ in. Price 25s.

A.C. Machines

by M. Liwschitz-Garik, DR. ING., *and C. C. Whipple,* E.E.

THE first edition of this book appeared in 1946 and, after eight reprintings, it has now been largely rewritten for the second edition. It is intended as an American undergraduate textbook and the first 49 chapters deal with transformers and rotating machines on the basis of four fundamental laws. In this part, the author deals with subjects ranging from the parallel operation of transformers, through induction motors and two reaction theory of machines to considerations of hunting in synchronous motors and methods of speed control. In the 60-page second part of the book, intended for more advanced students, the magnetic circuit is considered in more detail and attention is given to such aspects of machines as fractional slot windings, radial forces and vibration, and pulling into step of synchronous motors. The book has an extensive list of references and each chapter is followed by examples. Answers to over 200 numerical problems are also included. Published by D. Van Nostrand Inc., 604 pages, 9 in. by 6 in. Price 112s 6d.

BOOKS RECEIVED

Graphiques des Fonctions Usuelles pour Calculs Numeriques Rapides, by C. Maynart. Various mathematical functions presented graphically. These include factorials, Bessel functions, Fresnel integrals and Legendre polynomials amongst others. Published by Editions Eyrolles, 117 pages, 10½ in. by 8 in. Price 19.20 NF.

Nationalisation in Britain, by R. Kelf-Cohen. Study of the formation and working of British nationalised industries brought up to date. Published by Macmillan and Co., 380 pages, 8½ in. by 5¼ in. Second edition. Price 35s.

Relay Times and System Stability

TESTS carried out on large generators by applying three-phase short-circuits at the h.t. terminals of the generator transformers were described by Mr E. B. Powell, M.I.C.E., M.I.E.E., M.I.MECH.E. (CEGB), in the discussion before the IEE recently on system stability studies (ELECTRICAL TIMES, 30 Nov., page 808). We are now able to reproduce the diagram he showed illustrating the conclusions to be drawn from these tests in terms of system stability.

Mr Powell said that from a number of such tests on the CEGB system, it would appear that if the fault is cleared before the generator concerned becomes unstable, the remainder of the system, due to its size and close interconnection, will always remain stable.

Stability Criteria

If the problem is solved by the equal-area criterion, it will be found that if a machine is supplying an infinite busbar (which the CEGB system is, for all practical purposes), the maximum angle advance of the generator rotor should not exceed 85° referred to this infinite bus, if stability is to be assured.

It is a simple matter to calculate the angle advanced during the fault if it is assumed that the output of the generator is zero (neglecting all losses in the generator during the fault), and that the accelerating power is the steam input to the turbine

The angular acceleration can be expressed by

$\alpha = 180\ f\ dP/H$ electrical degrees/sec/sec

where f is the frequency in c/s, dP is the accelerating force on a per-unit basis, and H is the stored energy in kW-sec/kVA.

dP will be the same as the nominal power factor of the generator at full MW output.

The angle of advance during the fault will be

$$\delta = \tfrac{1}{2}\alpha t^2$$

where t is the time in seconds.

The rotor angle advanced during a three-phase fault is, therefore, independent of the characteristics of the network.

Test Results

The set of curves shown in Fig. 1 have been drawn for various values of H and dP. The machine will remain stable for short-circuit times to the left-hand side of the curves, and unstable when to the right-hand side.

The results of seven tests are shown on the diagram, and it is seen that the three-phase short-circuit for 0·68 sec with H=5 and dP=0·54 was unstable, as would be expected. Similarly, with H=8, the 1·32 sec fault was unstable. All other faults were stable.

The reason why the 0·38 second fault with H=5 and dP=0·80 was stable, although it is to the right-hand side of the curve for dP=0·8, is that in this instance the losses which occur sometimes when a fault is first applied were sufficiently great to delay acceleration for about 0·05 sec. This phenomenon is well known, but does not always occur, so cannot be allowed for when drawing the curves. For example, with the tests on the machine with H=2·8, the first test of 0·142 sec showed delayed acceleration, but in the test of 0·215 sec no delay in acceleration due to losses could be detected.

The use of a simple set of curves like those shown can be of great assistance to operating staff, since one can decide how long a three-phase fault can be allowed to exist without causing instability, and the setting of protective gear can be safely determined without any knowledge of the system to which the machine is connected.

These curves are, of course, pessimistic since in practice the slight losses on the machine do occur. Also, valve gear will probably be operating by the end of the fault, with the result that the true acceleration of the rotor will be slightly to the right of the theoretical curves.

We are indebted to Mr Powell for the diagram and these accompanying notes.

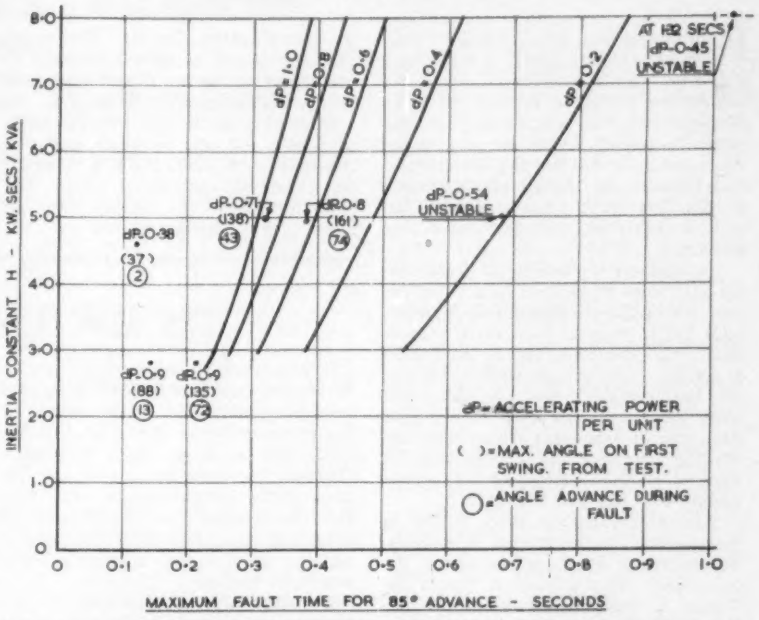


Fig. 1. Curves showing fault times which give a rotor angle advance of 85° under three-phase fault conditions for various values of inertia constant "H" and accelerating power "dP"

FUTURE OF SEMICONDUCTORS

SEMICONDUCTOR devices producing both high powers and high frequencies and combinations of the two were outlined by Mr E. Wolfendale, B.SC.(ENG.), M.I.E.E., at a recent lecture before the Electronics and Communications Section of the IEE.

Discussion of recent developments was mainly confined to the use of transistors in the v.h.f. and u.h.f. ranges. Mention was made, however, of the thermal problems inherent in power devices, and in particular of the resultant need for the collector to be mounted on a heat sink to ensure proper heat dissipation.

A 500 W audio amplifier was shown with 16 transistors in parallel mounted on an aluminium cooling fin. Good thermal contact could be attained by machine finishing of the aluminium or by use of a thin lead washer between the transistor and fin.

Turning to efficiency of high power devices, an inverter was demonstrated using two 50 A silicon controlled rectifiers producing 10 kW at 50 c/s and claimed to have an efficiency of 98·5%.

Higher Powers

In answering points raised in the ensuing discussion, Mr Wolfendale thought that higher powers at higher frequencies might be obtainable in the future through silicon transistors operating at higher junction temperatures and through the application of water cooling, although here the mechanical difficulties were formidable.

Common Market threatens home 'fridge sales

IF Britain entered the European Common Market, her refrigerator business would be "knocked sideways," Mr C. A. Ganderton, marketing director of AEI-Hotpoint told the Association of British Sales Promotion Executives last week. His reasons for thinking this were simply that German and Italian manufacturers in this field could produce models far cheaper than their contemporaries in this country.

Speaking on the subject of "Advertising and Sales Promotion in a Competitive Market," he asserted that advertising's prime purpose was as a weapon with which individual brands could gain a greater share of the market. He did not, however, think that advertising and sales promotion had ever been major influences in expanding the markets for washing machines and refrigerators. In spite of all this, advertising had grown rapidly over the past five years.

Sales promotion was more limited in the appliance market than in other fields. The higher an appliance was priced, the less likely sales promotion would influence a considered purchase. Promotions, other than those which were intended to increase general consumer awareness of a brand, probably fell into four main categories: Those aimed at getting display, consumer sampling, first-time stocking from dealers and dealer loading.

Extended Credit

Although bonus discounts and shared cost advertising were important means of inducing a dealer to stock particular appliances, extended credit was a more important incentive when Government credit restrictions affected retailers.

Turning to Hotpoint's approach to advertising and sales promotion, Mr Ganderton said that during the past five years their efforts had been mainly concentrated in the home laundry market. This market had itself increased in the period and, during that time, the company's share of sales to consumers had increased five times. Today their share of the washing machine market was estimated at somewhere between 25% and 30%. This made them the second largest washing machine manufacturer in Great Britain.

Advertising

In the washing machine field, Hotpoint began by assuming the customer was right and designing a machine to meet these requirements. Research carried out in 1956-57 showed that, whereas customers were generally satisfied with the wash performance they got from small machines, they had major criticism about wringers. The "Countess" was designed to meet this need and backed by advertising which was in no way evocative. It concentrated solely on selling the features of the particular appliance. In all advertisements for the "Countess," Hotpoint sought to pose a problem to prospective buyers and then to show how their product offered a solution.

In conclusion, he said that the appliance field was one in which economic conditions determined the role of advertising and sales promotion. So far they had controlled the destiny of the industry to an alarming extent.

When selling home laundry equipment it had to be borne in mind that consumers made the decision to buy a washing machine only after a period of time and consideration. It was essentially a considered purchase and in the majority of cases payment for the appliances was made over a two-year period on hire purchase. At present 60% were bought on h.p.

275 MW UNDERGROUND

INSTALLATION of a steam turbo-alternator rated at 275 MW is planned for the underground power station of the Swedish Power Board at Stenungsund, on the west coast of Sweden. Compact construction is necessary because of the unusual underground siting. It is claimed that the 275 MW sets will occupy a space not much greater than either of the previously supplied 160 MW sets in the station.

Stenungsund is to have an ultimate capacity of 900 MW. It is primarily intended as a reserve power station on the predominantly hydro Swedish network. Its importance is envisaged to be for meeting peak loads and for operation in relatively dry years. To this end, it is situated a fairly short distance from one of the main 400 kV north-south lines that link Sweden's hydro-rich north to the southern population centres.

The machine is being supplied by the De Laval Ljungstrom Turbine Co., and is of the "Quad" type, with four identical generators. Fig. 1 shows the general arrangement of steam flow, with steam entering one radial blade system at 2,005 lb/sq in., 1,000°F, and being reheated to 1,000°F before entering the second radial system. Thence it is led to four l.p. axial blade systems.

The design is the largest yet made to use the advantages of the radial turbine. These are, in particular, quick starting, high thermodynamic efficiency and ability to handle relatively large volumes of steam with reasonable exhaust losses. Total steam outlet area is 222 sq ft. The set is intended to operate with cooling water at only 43°F.

Boiler feed pumps are driven by a back-pressure extraction turbine of about 7 MW rating. This turbine takes its steam from the h.p. turbine of the main set, and delivers extraction and exhaust steam to feed heaters. There are seven stages of feed heating, giving a final temperature of 480°F.

The generator of the set is built in four parts, a factor that is of importance in easing transport problems.

It is estimated that given an operating time of 3,000 hr/year, the 275 MW set in a 900 MW thermal station might, at today's oil prices, produce energy competitive with that from a hydro station.

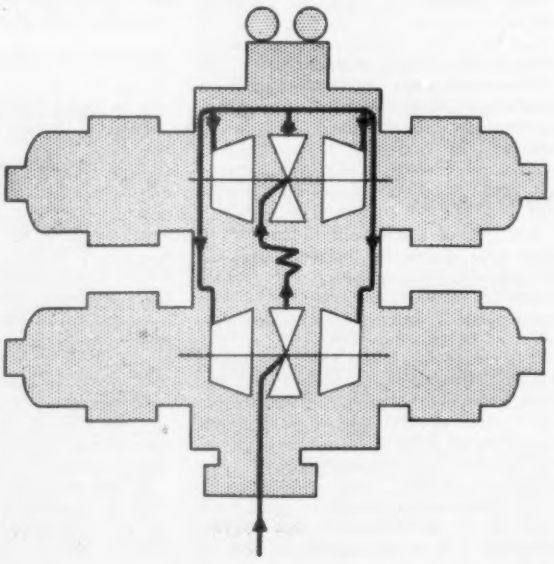
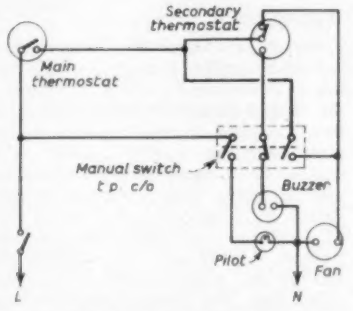


Fig. 1. Steam flow in the two radial turbines involves reheating the steam to the initial temperature of 1,000°F, between the first and second h.p. turbines. The four alternators are arranged around the turbine block

PROBLEMS AND PRACTICE

We welcome contributions to this feature; those published will be paid for at our standard rates. There must be many problems encountered in day-to-day electrical work, or useful ideas or tools devised to facilitate tasks; all make instructive reading.



An auxiliary thermostat on a domestic boiler installation warns forgetful householders if they omit to top up the fuel

Safety Thermostat

IT sometimes happens that a domestic boiler of the solid fuel forced draught type goes out, often at night, due to some reason, which usually is because the householder has forgotten to fill the magazine with fuel. It is desirable for some warning to be given, not only because of the loss of heat and subsequent work of re-lighting, but also because the blower motors are usually intermittent rated and may be damaged if allowed to run too long.

In my house I have installed a secondary thermostat of the clamp-on type which is set to close at a lower temperature than that of the main thermostat, and which operates a warning bell or buzzer to notify me if the boiler needs attention, before it is too late. A triple-pole changeover switch and pilot lamp has also been incorporated to enable the secondary thermostat and bell to be disconnected when necessary, the pilot lamp showing that the circuit is out of commission. The wiring diagram shows how the circuit works.—*L. Giltrow.*

Lifting Floorboards

AS one who entered the industry at a time when the ability to take up a floorboard neatly and expeditiously was the first thing which seemed to be looked for in an electrician, I was interested to read the contributions by F.S. (10 Aug.).

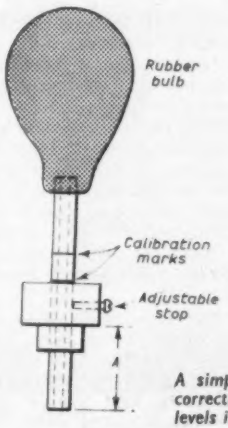
Where cuts are made across the floorboard with a padsaw, it seems to be the usual practice to drill a hole to start the saw. A better plan is to start the saw in the gap between the boards and to gradually describe a small arc to bring the saw round, cutting the board at right-angles to the direction in which the cut was started. Before replacing the board, the ends must be supported on a short length of batten fastened to either the joists or to other floorboards.

To cut the board above the joist, and assuming that the modern lifting devices are not available, it is sufficient to cut the tongues on either side of the board, punch the nails through and then to lever the board proud of the surface supporting it with a bar of metal similar to a tyre lever. A tenon saw can then be applied without risk of cutting through gas pipes, cables or other services which may lie under the boards. We always used to punch down the cut nails favoured by floor-laying carpenters and refix the boards with screws.

Finally, drilling joists is always preferable to slotting as this not only firmly locates the cables but they are less liable to damage when drilling joists for fixing screws or nailing down the flooring. It helps to drill at an angle but, to simplify the threading and pulling-in of the cable afterwards (and assuming that conduit is not being used) adjacent drill holes should be started from opposite sides of the joists.—*J.S.B.*

Electrolyte Level Corrector

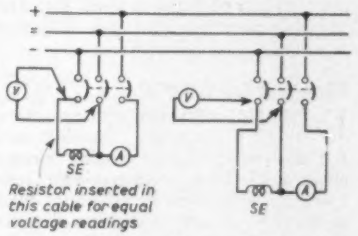
A SIMPLE device for topping-up of accumulator cells to the correct level with distilled water is shown in the diagram below. It was made from an old ball-point pen casing, a piece of "Paxolin" rod and a rubber bulb, in a few minutes at the bench. The stop is set from a cell filled to the correct level with the end of the tube just touching the electrolyte level. With the device full of water, the other cells are visited in turn and the bulb pressed to deliver more than the required amount. On releasing, the excess is drawn back into the bulb until the end of the tube is exposed by the lowering level of the electrolyte in the cell.—*E.A.R.*



A simple device for correcting electrolyte levels in battery cells

More Marine Problems

A 400 kW 220 V d.c. marine generator which had been out of commission for some time showed low insulation resistance due to dampness. The measured value was below 1,000 ohms and attempts to dry out by means of external heaters and a covering were not successful. Finally, a short-circuit was applied across the busbars and the machine was run for a period with the series winding out of circuit and the shunt field partially excited from a 110 V supply to give about 75% of full load current in the windings, as measured by an ammeter. After about 3 hr, the resistance improved to 1½ megohms.



A simple case of equaliser trouble on marine generators

In another case trouble was being experienced on load sharing between four sets. One and two would run satisfactorily in parallel, and so would three and four, but any other combination led to grossly unequal load sharing. Since two of the sets were close to the switchboard and two some distance away, it appeared that equalising arrangements were not satisfactory and, to establish this, voltage readings were taken between the equaliser and negative terminals at the switchboard with the machines being run, one by one, on full load. There was a considerable discrepancy between the readings on the first pair and those on the second. The obvious cause was the difference in the resistance of the negative and equaliser cables between the machines and the switchboard. Resistances were inserted in the equaliser lines of the machines closer to the board to make the total resistance of the leads the same for all machines. After this, load sharing was effectively maintained regardless of the number of machines in service or the manner of pairing.—*W.J.S.*

new products and appliances

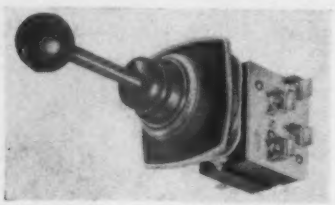
Italian wobble switches

INCLUDED in the range of CEMA equipment now being imported by Shawford Control Gear are two types of wobble switch suitable for quick control of a number of circuits. Selection of four separate switch positions is made by a short selector arm, similar in action to that of a car gear lever, connected by a nylon actuator to a double contact switch block. In one type (T4TN-2) the selector, on release, self-centres to the neutral position, while in the other (T4SN-2) it remains in the selected position until manual cancellation. Claimed to be completely oil tight, the unit has an overall length of 5·6 in. and is made for voltages of 110 V to 550 V a.c. or d.c. Normal and starting current ratings at 220 V a.c. are 4 A and 35 A, respectively. A two-position selector of similar design is also available. *Shawford Control Gear Co. Ltd., Midland Terr, Victoria Rd, Willesden, N.W.10.*

Elements for 1,700°C

DESIGNED for temperatures up to 1,700°C in air, the Crystolon super hot rod is a furnace heating element claimed to have an exceptional resistance to ageing due to oxidation. Made in the form of tube of uniform diameter, the silicon carbide element has a spiral cut through the tube wall, thus providing the high resistance for the central hot zone, leaving unspiralled cold ends which pass through the furnace walls. This type of element is similar to that used in the "Crusilite" range for temperatures up to 1,575°C, but for the higher temperature operation of the new element, the silicon carbide base is impregnated with a molybdenum disilicide in the hot zone giving resistance to oxidation. Metallic impregnation is used to lower the resistance of the uncut ends of the tubes, which are sprayed with aluminium to provide a low resistance contact for aluminium braid connectors.

Service life of the element is dependent on a number of factors, including the electrical loading in watts, element temperature and its surrounding atmosphere. Maximum allowable loadings vary from 90 W/sq in. of hot zone section at 1,200°C to 10 W/sq in. at 1,680°C, with an optimum loading of 20 W/sq in. to 40 W/sq in. Since the oxide protective coating melts at 1,720°C it is recommended that the element temperature does not exceed 1,700°C in air. These elements can also be used in atmospheres of various gases up to a maximum element temperature of 1,600°C. *Morganite Electroheat Ltd., Point Pleasant, Wandsworth, S.W.18.*



Italian wobble switch for circuit control

Quick temperature readings

MERCURY-IN-STEEL thermometers with remote vertical scales in place of normal dial indicators have been introduced by British Rototherm. Covering a temperature range of −30°F to +1,200°F, the thermometers are connected to vertical scale indicators by copper-sheathed capillary tubes having stainless steel flexible armouring at the connection points. Indicators are housed in light alloy castings, finished in hammer grey, with scales measuring 7½ in. long and 2 in. wide. A bank of six indicators measures 9¾ in. by 11½ in. overall. Capillary tubing is provided in 10 ft lengths, but up to 120 ft can be supplied if necessary. Price of each instrument with 10 ft of capillary is £17 15s 0d. *British Rototherm Co. Ltd., Merton Abbey, S.W.19.*

Lighting for hospitals

A RANGE of lighting units designed specifically for hospital use is now available from Falks. For general ward lighting there is an all-metal louvred fitting which can be either pendant or ceiling mounted. This fitting is specially designed without ledges to avoid the collection of dust. It uses a 200 W e.s. lamp and also has a 15 W s.b.c. pygmy lamp as emergency lighting.

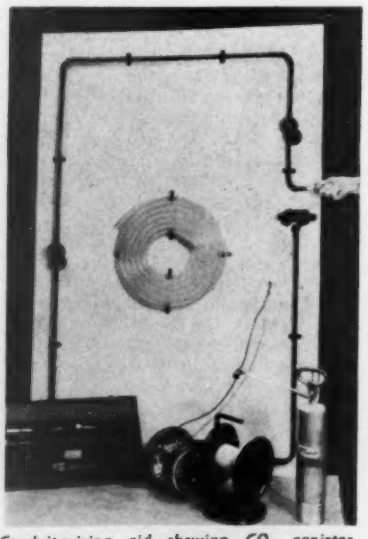
Especially for mental hospitals is a recessed ceiling fitting with a detachable bezel for carrying a flat armour-plate glass panel. It has three 60 W e.s. lamps as a main light source and a 40 W b.c. centre emergency lamp. Finish is in white enamel and the fitting is provided with a safety chain and "secret" locking screws.

For the operating theatre there are three fittings all using the same basic ceiling unit, which can be easily adapted for recessed or surface mounting. Each has an emergency light and is constructed to withstand hosing down. The armour-plate glass is sealed with a neoprene gasket and finish is in white enamel.

To provide a low level of light during the night time, a wall-mounted unit has been designed for siting between hospital beds. It is totally enclosed and uses two 15 W pygmy lamps. This fitting is semi-recessed and has a Perspex visor, clear on the underside and the remainder opalised. *Falk, Stadelmann Ltd., 91 Farringdon Rd, E.C.1.*

Wiring aid

CLAIMED to enable electric cable to be pulled through a continuous run of conduit up to 300 ft in length is the "Rapid-Dusenmax Jetline," which is now available in this country. Equipment comprises a steel cylinder filled with 4½ lb of liquid CO_2 gas. It is fitted with a simple release mechanism connected to a conical washer at the end of a plastics tube which fits into the conduit. A bobbin is inserted into the end of the conduit with a length of nylon line. The conical washer is then placed in the end of the conduit trapping a protruding end of the line and, at the same time, sealing the opening. A small amount of gas is released forcing the bobbin through the conduit at high speed, trailing behind it the nylon line. The operator has complete control and can either feed the line through in short bursts or in a continuous line. It is said that curves and angles in the conduit do not present problems. When the line reaches the end of the conduit, cables are simply attached and pulled through. The equipment is designed to be used with conduit of ½ in., ¾ in., or 1 in. diameters. Retail price is £39 10s. *Explosive Power Tools Ltd., Hope St, Dukinfield, Ches.*



Conduit-wiring aid showing CO_2 canister, bottom right. The gas is used to force a bobbin trailing a nylon line through a 300 ft length of conduit

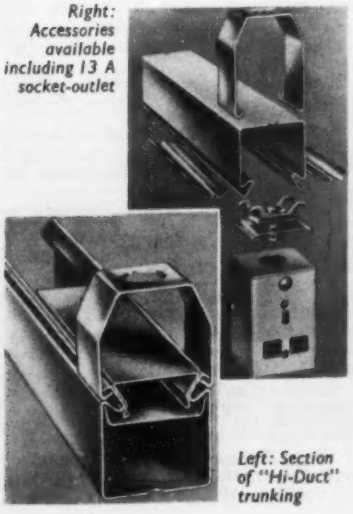
Cutting cable armour

TO avoid damaging the underlying insulation when cutting cable armour with an ordinary hacksaw, a new saw has been introduced which is designed to cut to a pre-determined depth. The saw frame limits depth of cut by adjustment of Allen screws on top of the frame to give a blade projection ranging from $\frac{1}{16}$ in. to $\frac{7}{16}$ in. Rigidly held along its whole length, the blade is of the hacksaw type measuring 6 in. and fitting tightly into the frame leaving no gap to become clogged with cable-serving material. Overall length of the saw with handle is 10 in. Price is £1 12s 6d. *Abbot, Birks and Co. Ltd., 90-91 Blackfriars Rd, S.E.1.*

Suspension Trunking

FOR use wherever a variety of electrical equipment is needed, new "Hi-Duct" trunking provides a versatile system for supplying and fixing suspended heating and lighting fittings. No tools are required for the fixing of cover lids, couplings or hanger clips, thus facilitating alterations to existing sections. Due to its rigid construction, infrequent suspension is needed and a wide range of accessories can be used without cutting or drilling. It is supplied with self-centring friction couplings, which join adjacent sections without additional fastenings and ensure complete earth continuity. Cover sections are secured by spring action, but the design allows for them to be instantly removable. A special attachment assembly can be fitted, on which is mounted a pressed-steel box containing a 13 A socket-outlet, arranged so that the plug can enter from either the side or underside of the trunking. Other accessories include internal cable retainers, hanger clips for fittings and ceiling suspension brackets. Trunking is made of galvanised steel and is supplied in 12 ft lengths with 6 ft cover sections. *The Power Centre Co. Ltd., Wednesbury, Staffs.*

Right: Accessories available including 13 A socket-outlet



Left: Section of "Hi-Duct" trunking

Flexible heating pads

SAID to be suitable for a wide range of applications are flexible heating pads manufactured by a recently formed company. They use a resistance wire, generally Eureka or Nichrome, embedded in rubber or synthetic rubber. The pitch of the resistance wire track is said to be such that a uniform surface temperature is obtained. Maximum wattage the pads can dissipate is controlled by the temperature limit of the casing material, but manufacturers say they can be produced up to an operating temperature of 210°C. A wide range of sizes and shapes are available for high and low voltage supply. *Thermotex Ltd., Elstree Way, Elstree, Herts.*

Control for conveyors

A CONTROL system for conveyor belts is being manufactured in this country by Honeywell Controls. Known as the "MagiCare" system, it is said to enable an operator to summon individual articles to the delivery point by selecting the appropriate position on a dial. It can be used in conjunction with a continuous conveyor, which is intermittent in operation, and with a reversible conveyor, when it is said to always select the shortest route. The equipment can be installed remote from the conveyor system. *Honeywell Controls Ltd., Greenford Middx.*

Improved seed propagator

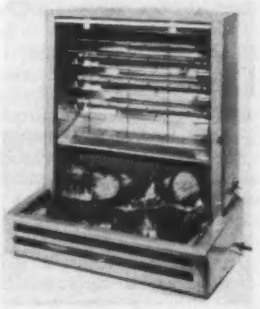
AN improved version of the "Camplex" electric seed propagator is now on the market. It has automatic temperature control and neon indicator lamp. The outer frame is constructed on polyester glass-fibre and temperature in the interior is maintained by an 18 in. rod-type soil thermostat. This is said to operate accurately between 50°F and 70°F. Loading is now increased and the unit is heated by two 50 W sheathed-wire elements. It is supplied with 6 ft t.r.s. flexible cable for a.c. mains connection. The propagator is 2 ft wide and 3 ft 2 in. long and sells at £14 18s. *Simplex Dairy Equipment Ltd., Sawston, Cambridge.*

ANOTHER NEW 'FRIDGE FROM M.-R.

YET another new refrigerator in the "Astral" range comes on the market this month from Morphy-Richards, this time a 4·6 cu ft model which the manufacturers say will replace their 4 cu ft 'fridge, A400. Known as the A460, this new absorption model sells at 47 gn, including purchase tax and surcharge. Square-line styling conforms to modern design trends and the refrigerator has a dual compartment evaporator, the upper section holding two ice trays and the lower providing storage space for up to 10 lb of frozen foods. There are four full-width adjustable shelves, chrome plated with silver coloured trim. A deep full-width salad drawer is also provided and the door liner has storage space for bottles and dairy foods.

The door, which can be right- or left-hand mounted, is fitted with a self-sealing magnetic gasket. Adjustable feet are fitted to provide for uneven floors and the refrigerator is available in either white or cream stove enamelled finish with two-tone blue interior. The A460 is rated at 120 W and will operate from standard a.c./d.c. voltages. It is thermostatically controlled and measures 22 in. wide by 23½ in. deep by 41¼ in. high.

Latest addition to the "Astral" range is the A460



One of the trio of new "Solway" coal or log effect heaters

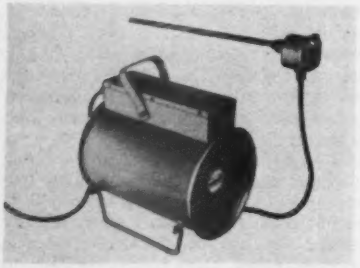
M-R have also extended the range of their "Solway" heaters and are launching three new models during this month. These new models, which join the "Solway" 2 kW coal effect, introduced earlier in the year, are a 2 kW log effect, 3 kW coal effect and matching 3 kW log effect heater. The 2 kW models have two 1 kW radiant elements, controlled individually with separate switches. The larger models have three 1 kW elements and have single switching for one element and another controlling two elements. The coal and log flicker effects can be used independently of the heating elements if required. Prices of these new models range from £13 11s 7d to £14 12s 11d. *Morphy-Richards Ltd., 50 Conduit St, W.1.*

Life-saving model

TO aid instructors in demonstrating the mouth-to-mouth method of artificial respiration, a simple model, known as a manikin, has been devised not only to show the principles of this method, but also to illustrate the anatomical features involved. The mouth-to-mouth method is gaining ground over the more conventional means of artificial respiration and is of particular use where severe injuries to the chest or arms have been sustained. To overcome the obvious problems of teaching this method to first-aid and life-saving teams, manikins have been designed to give safe and hygienic demonstrations to mixed classes of all ages. This recent model consists of a cross-section of the head and neck, showing the airway formed with the mouth and nose. It also shows the need for the full extension of the head on the neck to allow the tongue to come forward and not obstruct the airways. On the passing of air through the airway, a rubber replica of the lungs is inflated, which is shown by the rise of a wooden board representing the chest wall. The resistance of the lungs to air is provided by the elasticity of the rubber, which also causes the air to be expired when the rescuer removes his mouth. The manikin hinges and folds flat for travelling. *Siebe Gorman Co. Ltd., Neptune Wks, Davis Rd, Chessington.*

Heater for glasshouses

DESIGNED for the humid conditions encountered in horticultural applications is the "Humex Turbo-Heater." It is constructed of rustproofed sheet steel, with an interior heat-resisting finish of aluminium. The mineral-embedded nickel-chrome heating element is totally enclosed. The heater has a fan unit delivering 250 c.f.m. loaded to 35 W and operating on standard a.c. voltages. Temperature is controlled by a 24 in. rod thermostat connected to the heater by 9 ft of flex. During warmer months, unheated air circulation can be carried out by operating a manual air/heat switch. There are two models available: the 3 kW HT/2, priced at £25, and the smaller HT/1 loaded to 1·5 kW, which sells at £22. Makers say that a 4·5 kW model will shortly be available. Loadings of the "Humex" garden frames are 300 W and 150 W and not, as previously stated, 3 kW and 1·5 kW. *Roberts Electrical Co. Ltd., Humex Hse, High Rd, Byfleet.*



For humid conditions, the "Humex" turbo-heater

High-gain transistors

CURRENT gains of 20,000 to 30,000 are claimed from a new range of composite transistors designed to give the high current gain normally associated with a cascaded amplifier. Four types of germanium-silicon composites are available, n-p-n, p-n-p, p-n-n and n-p-p, intended as low frequency devices with a cut-off frequency of 7 kc/s. Brief characteristics include a dissipation of 10 W and a voltage between collector and base of 30 V, with a collector current of 3 A. *Walmore Electronics Ltd., 11-15 Betterton St, Drury La, W.C.2.*

Price change . . .

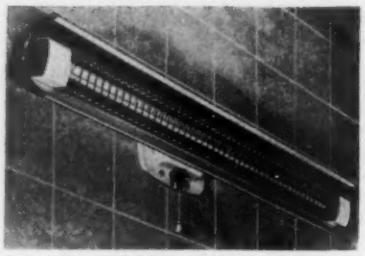
Stella Radio and Television announce reductions in the prices of the Ada 3 cu ft and 4·5 cu ft refrigerators. The new prices, which came into effect on 1 Dec. are 42 gn and 59 gn, respectively.

. . . Dealer offer

Monogram are extending their "Baker's Dozen" blanket offer to retailers until 31 Dec. This offer entitles a retailer purchasing 12 "Monogram" electric blankets to one "Monogram" underblanket free of charge.

Low price heater

A LOW priced, high level infra-red heater is now available from Thermair and sells at £4 10s including purchase tax and surcharge. Called "Silglow," it is intended for use in bathrooms and kitchens and is rated at 750 W. It has a single silica-sheathed element and the aluminium reflector is hinged to facilitate easy cleaning.



"Silglow," a 750 W infra-red heater by Thermair

Finished in white or cream stove enamel, the heater is 27½ in. long by 3¼ in. deep, and the maximum projection from a wall is 4¼ in. It is for standard a.c. voltages and has a double-pole pull switch. *Thermair Domestic Appliances Ltd., Izons La, Oldbury Rd, W. Bromwich.*

Ekco prices up

INCREASED production costs are said to be the reason for Ekco increasing the prices of the "Thermostor" industrial and domestic block storage heaters. The new prices came into effect on 1 Dec. and at the same time trade discounts were increased.

New prices of the "Thermostor" range, including purchase tax, are:

TTC15	1½ kW	£21 5s	1d
TTC2	2 kW	£24 18s	0d
TTC3	3 kW	£30 7s	3d
TDM25	2½ kW	£25 18s	0d

The price of the TDM25 domestic model includes a net siting charge of £1. *Ekco Heating and Electrical Ltd., Southend.*

TRADE PUBLICATIONS

BRUCE PEEBLES.—Leaflet describing frequency generators for control-rod operation. Bruce Peebles Ltd., Edinburgh 5.

CLAUDE LYONS.—Information sheet on a.c. mains voltage stabilisers. Claude Lyons Ltd., Valley Wks, Ware Rd, Hoddesdon.

R. H. COLE.—Pamphlet giving details of various Siemens and Halske semiconductors. R. H. Cole (Overseas) Ltd., Caxton St, S.W.1.

CONSULTAIR.—60-page loose-leaf reference book for those concerned with control equipment. Consultair Ltd., Handsworth, Birmingham 19.

ELREMCO.—Leaflet describing miniature relay Type LB. Electrical Remote Control Ltd., Harlow New Town, Essex.

EMB.—Leaflet detailing Microsen speed control unit for a.c. slip-ring motors. EMB Co. Ltd., Moor St, West Bromwich.

IAEA.—Advance information regarding new publications, "Chemical Effects of Nuclear Transformations" and "Radioisotopes in the Physical Sciences and Industry." IAEA, Kaerntnerring 11, Vienna 1, Austria.

INCO MOND.—Two booklets, one entitled "Low Alloy Constructional Steels" and the other "Nickel-containing Magnetic Materials." International Nickel Co. (Mond) Ltd., Thames Hse, Millbank, S.W.1.

KERRY'S.—Catalogue of wholesale goods from Kerry's (GB) Ltd., Warton Rd, Stratford, E.15.

LYONS.—Pamphlet describing GR digital time and frequency meter. Claude Lyons Ltd., Valley Wks, Ware Rd, Hoddesdon.

MIDLAND RESISTANCE.—1962 technical sales catalogue of vitreous and wire-wound resistors. Midland Resistance Co. Ltd., Cambridge St Wks, Rugby.

NEGRETTI AND ZAMBRA.—New meteorological instrument catalogue dealing with wind direction and velocity instruments. Negretti and Zambra Ltd., Regent St, W.1.

PARTRIDGE WILSON.—Leaflet describing "Davenset" 30 A battery booster. Partridge Wilson Ltd., Davenset Electrical Wks, Leicester.

PLANNAIR.—Leaflet detailing assembly cabinet. Plannair Ltd., Windfield Hse, Leatherhead.

ROTUNDA.—Brochure describing electrical insulating and protective tapes. Rotunda Ltd., Denton, Manchester.

SIMPLEX DAIRY EQUIPMENT.—Series of leaflets describing electrical horticultural equipment. Simplex Dairy Equipment Co. Ltd., Sawston, Cambridge.

SMITHS.—Colour printed catalogue of "Sectric" mantel and wall clocks. Smiths Clock and Watch Divn., Sectric Hse, Waterloo Rd, N.W.2.

T.M.C.—Leaflet giving details of extensible line connector. Telephone Mfg. Co. Ltd., Martell Rd, West Dulwich, S.E.21.

VACTRIC.—Broadsheet with details of a.c. motor tachogenerator. Vactric Control Equipment Ltd., Bouverie St, E.C.4.

WHITE.—Leaflet detailing "Interscale" measuring instruments. White Electrical Instrument Co. Ltd., Amwell St, Rosebery Ave, E.C.1.

WYLEX.—Monthly bulletin of "Wylex" products. G. H. Scholes Ltd., Wylex Wks, Wythenshaw, Manchester 22.

News of the Week

SWITCHING ERROR CUTS OFF S.E.

Human Element at Northfleet Commissioning Tests

SUNDAY lunches suffered for the second time this year as a result of the power failure last Sunday in south east England. The explanation was easier to understand this time than on the previous occasion, for according to the chairman of the CEGB, Sir Christopher Hinton, it was due to human error in carrying out switching during commissioning tests. We understand that commissioning tests were being made on the No. 5 120 MW set at Northfleet station when a 132 kV isolator was manually opened in error, with the machine on load.

The resultant arcing caused a short-circuit which operated the busbar protective equipment and switched out the other Northfleet generators. Subsequently, circuit-breakers on the supergrid opened at Bankside, Beddington, Tunbridge Wells and Lewes, isolating the south east from the rest of the country. The fault occurred at 1.45 p.m. and supplies were restored by 3.31 p.m. Littlebrook power station remained in operation and continued to supply parts of Kent, but at reduced frequency.

Current was off for only 6 min on the BR southern region lines in Kent, although there were some signal failures until 3 p.m. caused by the breakdown.

The previous power failure, on May 15, was attributed to overloading and automatic operation of protective equipment.

Ghana Revoke Import Licences

IN a brief notice in the official Ghana Gazette, the Ghanaian Government has revoked all open general import and export licences and quota licences. The revocation takes immediate effect, but special import licences will be issued for goods shipped before midnight on 30 Nov.

Ghana is a sizeable customer for British electrical goods, taking nearly £500,000 worth of cables and £285,000 worth of generators and motors in 1960. This trade looks like being chaotic for the time being, as specific licences will now be needed in every case.

No Need for All-power Council, says Minister

THE Commons were told last week by the Minister of Power that he saw no need for a fuel and power council composed of representatives from all fuel and power industries. He said it was his statutory duty to promote the efficient use of all types of fuel and he saw no need for the kind of additional organisation suggested. This subject will play an important part in the work of the proposed National Economic Development Council.

Philips Build Another Scottish Factory

HELPING to relieve Scotland's unemployment problems, the light electrical industry in Scotland is gradually building up. Latest to announce expansion plans are Philips Electrical, who are to build a 50,000 sq ft factory at Dunfermline, and also to extend by 80,000 sq ft their existing factory at Hamilton.

The new factory will be used to make components, though what type has not finally been decided, and will need a labour force of about 400 employees.

Appliances Sales Down

RADIO and electrical shops were the Cinderellas of the retail trade in October, the BoT index shows. Compared with a year earlier, sales were down 2%, whereas trade as a whole advanced about 2%. Retail sales generally were around 1% lower in October than in September, but electrical goods shops sold 4% less.

NUCLEAR SOCIETY ANNOUNCE PROGRAMME

A PROVISIONAL programme for the British Nuclear Energy Society, which replaces the British Nuclear Energy Conference on 1 January next, has now been issued. It provides for nine meetings during 1962. The BNEC was a joint organisation sponsored by a number of engineering institutions to provide a channel for interchange of knowledge and experience on nuclear energy matters. The new British Nuclear Energy Society will provide a central forum for the discussion of nuclear energy, using the premises of the Institution of Civil Engineers as a meeting place.

The BNES is to publish a quarterly journal which will contain original papers, and discussion on them, as well as reprints of important papers in the nuclear field.

Besides members of constituent societies of the BNEC, others who are "actively engaged in the professional, scientific or technical aspects of the application of nuclear energy and ancillary subjects" will be able to join the BNES.

To ensure continuity, for the first year the affairs of the new society will be managed by the present board of the BNEC. After that, the board will include members elected from the general membership of the Society.

Included amongst the meetings planned for the BNES is a symposium on pressure tube water reactors (4 July at Risley) and a two-day symposium on 13 Sept. and 14 Sept. on the advanced gas-cooled reactor symposium. The first meeting is scheduled for 31 Jan. and will be concerned with plutonium fuel for nuclear power.

Pay Pause Direction Illegal?

THE Prime Minister considers that it would be illegal for the Government to direct a nationalised industry to comply with its pay pause policy when a wage claim is under consideration. He said this in answer to renewed questions about the Electricity Council settlement last week.

Further questioned, Mr Macmillan declined to comment on the suggestion that, under existing law, it must be a possibility for Ministers to give a general direction to boards "to require that their general economy and financial policy is in consonance with that of the Government, including wage restraint."

In a written answer to another question he said that, during the summer, Ministers explained to chairmen of nationalised industries the need for the pay pause and asked that "the lead given by the Government in the sector under its control should be followed in those parts of the public sector outside the immediate control of the Government as well as in the private sector."

The first of two 14 MVA generator transformers for the Afam power station of the Electricity Corporation of Nigeria, recently completed at C. A. Parsons and Co.'s Heaton works. The contract also includes two 10 MVA transformers

NAVAL DOCKYARD SWITCHES TO GRID

AFTER 56 years of generating its own electricity supplies for warship building, maintenance and repair, HM Dockyard, Chatham, switched over to the national grid system last week. The new 11 kV ring-main circuit, costing some £250,000, replaces the dockyard's own generated 3·3 kV supply. Main contractors for the project were the English Electric Co. and Enfield-Standard Power Cables Ltd., along with the South Eastern Electricity Board.

When the dockyard power station was opened in 1905, it had 1,500 kW of plant; today the demand is over 16 MW, with a consumption of over 50 million units a year.

The new supply is taken from Seeboard's 33 kV system, via a dockyard substation at Upnor, stepped down to 11 kV and then via submarine cable across the River Medway by two routes into the ring-main system, embracing eight distribution substations and a further substation on a spur feeder. Existing standby supplies from another point are led into the system at two of the substations. Dockyard loads can be energised either direct at 11 kV or at 415 V with remote control at a central control room.

Part of the existing station will accommodate frequency changers for converting mains supplies to 60 cycles required for warships of the Royal Navy and NATO countries now using a.c. systems. Rotary converters providing d.c. will remain.

Electronic Aids to Banking

CLOSED circuit television, accounting and other types of electronic computer and automatic cheque sorters will be discussed at a symposium on electronic aids to banking organised by the IEE for 17 Jan. and 18 Jan. next.

Object of the symposium is to speed up the progress of mechanisation in banking by bringing together bankers and electronic engineers. Opening papers at the symposium will deal with problems the banks meet in using electronic aids. Later sessions will deal with equipment and operating methods.

Registration forms and further details of the symposium, to be held at the IEE headquarters, are obtainable from the Secretary, IEE.

60 Years of Radio

ON 12 Dec., 1901—just 60 years ago—Senator Gulielmo Marconi sent his historic first signals across the Atlantic from Poldhu to Newfoundland. From such small beginnings have sprung the vast radio industries and networks of the present day. To many the equipment which he used is familiar from photographs in various popular and text books and, to commemorate the sextennial anniversary, a small exhibition is being arranged at the South Kensington Science Museum.

This will be open to the public from 10 a.m. to 6 p.m. on weekdays and 2.30 p.m. to 6 p.m. on Sundays from 13 Dec. to 25 Jan. A number of the earlier items of radio equipment, some of unique historic interest, will be on view.

OFFICIAL PUBLICATIONS

Homes for Today and Tomorrow. Ministry of Housing Report. HMSO. 4s (see page 843).

Strategic Goods (Control) Order, 1961. S.I. No. 2242. HMSO. 1s 6d (see page 864).

BS 1432. Copper for Electrical Purposes. Strip with Drawn or Rolled Edges. 7s 6d.

Fume Control Sufficient says M.o.P.

Reply to M.P's attack

COMPLAINTS about obnoxious fumes from power stations, particularly Battersea, were made in the Commons last week by Mr P. Noel-Baker. He asked the Minister of Power to give a general direction to the CEGB to secure the elimination of these fumes. The Parliamentary Secretary to the Minister of Power indicated that the Minister saw no need for such a directive, as control of emission of fumes from power stations was primarily the responsibility of the Alkali Inspectorate.

Mr Noel-Baker said that power stations in his constituency of Derby were causing a great public nuisance and the power station at Battersea was making Battersea Park "almost unusable."

The Parliamentary Secretary to the Ministry said that there had been no recent complaints about nuisance from Battersea. The CEGB had redesigned and modified the gas washing plant at the station and the periods when it was out of operation would in future be less frequent and shorter.

The CEGB was under obligation to wash flue gases in order to remove sulphur. Although fumes generally dispersed into the atmosphere, under certain atmospheric conditions gases fall to the ground. In the event of this occurrence the Alkali Inspectorate have advised the Board that in the public interest buoyancy of the gases should be maintained in order to ensure their disposal. This was even at the expense of some reduction in sulphur removal.

WORLD POWER CONFERENCE PREPARES FOR MELBOURNE

LATEST evidence of the steady advance to the sixth World Power Conference, to be held in Melbourne from 20 Oct. to 26 Oct., 1962, is release of a list of 23 papers by British authors, presentation of which has been arranged by a committee under Sir Josiah Eccles' chairmanship. Details have also been provided of eight post-conference tours of Australia and New Zealand.

Other WPC developments include preliminary work on a sectional meeting, to be held in Lausanne, Switzerland, from 12 Sept. to 18 Sept., 1964, and preparation for publication during the Melbourne conference of a world-wide survey of energy resources.

Amongst the British papers scheduled for Melbourne, the following are notable for their electrical interest: "Development and Operation of the British Grid System"; "Application of Low Load Factor Hydro and Pumped Storage Plant in GB"; "Advanced Reactor Systems in the UK"; "Experience of the CEGB with the Initial Nuclear Power Stations"; "Progress in Turbine and Boiler Design in Large Steam Power Units for Electrical Generation in GB."

Further information about the Melbourne plenary meeting of the WPC is available from the Secretary, British National Committee, World Power Conference, 201 Grand Buildings, Trafalgar Square, W.C.2.

Best Yet Display for Cologne Fair

Appliance makers book 3,150 sq ft in new hall

AN extra 150 sq ft this time will make the British electrical appliance manufacturers' display at the Cologne International Household Goods and Hardware Fair next spring their largest ever on the Continent.

Arranged by BEAMA and the BoT jointly for the third successive year, the British exhibit will once again be virtually exclusively electrical.

The number of exhibitors has risen from nine to 12. Dimplex, EE, GEC, Heatrae, Radiation, Simplex and the aluminium holloware makers, Corfield-Sigg, will be maintaining the continuity of their representation. Bulpitt, Burco, EC Power, Revo and Thermair will be taking part for the first time, while Berry's and Thorn are dropping out, the latter because new models may not be ready for display.

The fair, which takes place from 23 Feb. to 26 Feb., is a market place for trade buyers from over 60 countries. The British exhibitors will have 3,150 sq ft in the central island and around the perimeter of a new hall, which is well placed in the main flow of traffic.

No doubt the appliance section of the industry felt encouraged to increase their representation by their export success this year. For the first nine months they have lifted exports from £22·8 million to £25·1 million. Along with the electronics sector, they were the best performers.

Electrical exports as a whole rose by 10% to £238 million, and the Common Market proved the fastest growing field of all, with a jump of 45% to £34 million for the nine months.

Among the other exhibition plans for next year, BEAMA are co-operating with the BoT on a large exhibit in the British pavilion at the Lagos International Trade Fair. This fair has been timed to coincide with an African conference on the problems of transmitting electricity over long distances.

PRODUCTION RISES 11%

SEPTEMBER was a busy month for the engineering industries, with production, orders and deliveries all gathering pace quickly after the holiday period, the latest BoT indices show. At home, the decline in new orders in the preceding three months was reversed so that September's influx was 6% higher than a year earlier. Export orders continued to flow in at a higher level than last year and were up 4%. Deliveries for export were the same as a year earlier, leaving orders on hand some 9% higher, while home deliveries were 6% higher and orders on hand up 7%.

It is provisionally estimated that the volume of production was 11% more than in September, 1960, and in the second and third quarters 8% and 9% more, respectively, than the corresponding quarters of 1960. Production of capital goods continues to expand at the same steady rate as has been maintained since mid-1959.

H.F. Generator Contracts Pass to Petbow

THE government contracts which were to have been completed by Vernon Industries Ltd. are now to be transferred to the Petbow Ltd. factory at Sandwich. This was told to MPs last week by the Minister of Aviation. He said that Vernons had been taken over by Petbow, but the contracts were due to be completed at the former firm's Kirkby factory. However, Petbow decided to close this plant, so the contracts had to be transferred to Sandwich.

Scottish Building Code Delayed

THE new date by which objections to the draft regulations for building standards in Scotland must be received by the Secretary of State for Scotland is 16 Feb. The limit was originally 1 Dec., but the volume of the objections has brought the extension.

The draft regulations include detailed requirements about the technical standard and the adequacy of the electrical installation in houses and flats in Scotland, and about lighting and heating arrangements.

Amongst bodies known to have made representations about the regulations is the Scottish committee of the NICEIC.

In announcing the extension, the Government department responsible has noted that the Act under which the regulations are made gives substantial safeguards against "untoward, unnecessary or unreasonably expensive requirements." In considering objections, the effect of the draft regulations on private buildings in particular is to be considered.

About two-thirds of the representations about the draft standards have come from professional bodies, industry and local authorities. There has been no request for a public inquiry.

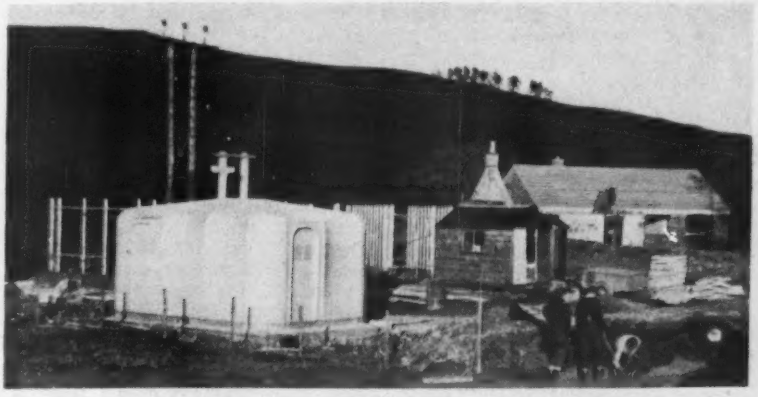
GLASS-FIBRE SUBSTATION TRIED BY S. SCOTLAND

A NEW idea in substation construction is being tried out by the South of Scotland Electricity Board. The reinforced plastics, colour impregnated, portable building illustrated below, erected at Marchmont, Dumfriesshire, accommodates 11 kV equipment. Composed of three basic sections—a corner unit and side sections of two different spans—it is easily erected on a concrete base, and can be readily extended by the use of additional sections.

The smallest building is 14 ft square, but the span can be raised to 18¼ ft, 23¼ ft or 28 ft, and the length increased as desired in increments of 4¼ ft. The building illustrated is 18¼ ft by 14 ft, and is of a 6 oz single skin laminate of polyester reinforced with glass-fibre. All corner units have provision for doors and ventilators. The units are bolted together with stiffening flanges of solid polyester, and bolted down to an *in situ* concrete floor slab.

Built by Mickleover Transport Ltd., it has been evolved from the building designed by Mr H. H. Powell, regional architect, under the general direction of Mr A. K. Terris, chief civil engineer, British Railways, Eastern Region, which was recently erected at Thames Haven Junction to house automatic signalling equipment.

The exterior and interior are finished in white and require no painting.



The glass-fibre substation erected at Dumfriesshire

A consignment of Aeroflex fuse-links awaiting shipment from Parmiter, Hope and Sugden's Manchester works to Crompton Parkinson Electrical Ltd., of Ontario. In the group are, left to right, Mr R. R. Kenderdine (CP), with Mr J. V. G. Hope (joint managing director), Mr E. W. Sugden (chairman and joint managing director) and Mr R. H. Dean (director) of Parmiters

"Unfair to Regent Street"

—says Christmas Lights Chairman

IT is not yet known whether Mr C. Abrahams will be reducing the price of Aquascutum overcoats at Christmas time, but he certainly thinks the charge for supplying electricity to Regent Street's Christmas lights should be cut.

At a lighting-up party at Verrey's Restaurant last week he told the guests of the Regent St Association: "It is most unfair. We have heard that Glasgow are paying 1½d a unit, but we are having to pay the top domestic rate of 6d. We might even refuse to pay the bill when it comes in."

But as an LEB spokesman pointed out to the ELECTRICAL TIMES, the 6d rate is not applied because it is the dearest, but because it is the cheapest rate than can be offered. Required for less than a month and coming at a time of peak pressure on the industry, the demand could not economically be met for less, nor should it be subsidised by other consumers. Possibly even at this 6d flat-rate commercial lighting tariff, which applies to similar Christmas supplies throughout London, it is not a paying proposition.

Discussions with the Regent St Association have taken place in the past, but this is Mr Abrahams' first term as chairman. In any event, Mr Abrahams is out of the argument for the time being; he left for America soon after the party. The lights were illustrated in our issue last week.

Embargo on Strategic Goods

THE list of strategic goods which, although located outside the UK, may not be sold to the Sino-Soviet bloc has been brought into line with the list of goods embargoed from export from the UK. To do this, the BoT have issued *The Strategic Goods (Control) Order, 1961*, Statutory Instrument No. 2242, which replaces an Order of 3 Feb., 1959.

Inquiries about embargoes should be addressed to Export Licensing Branch, BoT, Gavrelle Hse, Bunhill Row, E.C.1.

N.I. Minister suggests Power Review

A PROPOSAL that there should be an independent review of the electricity supply industry in Northern Ireland has been put forward by the Minister of Commerce, Mr J. Andrews. He has told Belfast Corporation Electricity Committee that it was considered desirable that such a review should be undertaken. The Minister is also sounding the other electricity supply authorities in Ulster for their views on the matter and has suggested that he might secure the services of Sir Josiah Eccles, the former deputy chairman of the Electricity Council, who is an Ulsterman, to undertake the survey.

FOUR TAKEOVERS THIS WEEK

UNLIKE breweries, the takeover moves which took place in the electrical industry during the past week were relatively small.

Grampian Holdings acquired the entire capital of Lumitron Ltd., N.W. London makers of fluorescent and other commercial lighting fittings. Price paid was £139,000, of which £49,000 was in cash and the balance in £45,000 of Preference shares and 42,106 Ordinary 5s shares. Adjusted profits of the new subsidiary for the year to June, 1961, were £41,790.

ALL shares in S. N. Bridges and Co., makers of electric power tools, small appliances and electric blankets, have been purchased from John Brown and Co. and minority shareholders by Stanley Works (GB). Stanley Works (GB) are Sheffield tool makers and are controlled by Stanley Works of the US.

AN offer for the shares of Wallis Tin Stamping, who have commercial refrigeration interests, has been made by Metal Box. The terms of one £1 Metal Box ordinary for every five 2s Wallis ordinaries are accepted by the Wallis directors and by Bovril interests. If this bid succeeds, Metal Box will also make an offer to acquire for 20,000 £1 shares Bovril's half interest in four associated companies, Whitecap International, Wallis Refrigeration (Retail Sales), Dorset Refrigeration Co. and Wallis's Refrigeration (Export).

NUCLEAR Investment Co., who have a wide electrical portfolio, are paying £15,315 cash for a controlling interest in Elcontrol of Hitchin, makers of controls for small plant. Mr B. A. Worswick, managing director of Elcontrol, will continue in office.

UNIT SALES RISE MORE SLOWLY

A SLOWER than average growth in unit sales took place in the three months to 30 Sept., Electricity Council figures show. Following a new policy, the statistics include Scotland for the first time, but as demand has been increasing more rapidly in both north and south Scotland of late than south of the border, this has served to mask the lower trend rather than accentuate it.

The overall growth in demand for the three months was 7%, compared with the September quarter of 1960, whereas the increase for the 12-month period was 9·7%. Public lighting was the only sector to do better than the four-quarter average, though the increase was slight, while traction was steady. The decline cannot be taken as seasonal, because the September quarter of 1960 showed a 13·5% increase over the corresponding three months of 1959, and was 1·3% higher than the four-quarter average. Also, the details of area board sales in October, published in last week's issue, show that the quieter trend is continuing.

In the latest quarter, the main slackening in demand was on the farms, which were the best performers a year earlier.

Domestic consumption continued to be the fastest growing sector, while industrial usage showed the greatest proportional decline in growth.

The figures refer to units metered or billed during the period.

	3 months ended		12 months ended	
	30 Sept. 1961	% gain over last year	30 Sept. 1961	% gain over last year
Domestic ...	7,333·4	+14·3	36,980·5	+16·4
Farm	446·4	+10·4	2,171·3	+15·0
Commercial ...	2,584·2	+10·2	13,903·7	+11·8
Combined dom./ commercial ...	334·5	+ 9·9	1,637·2	+11·6
Industrial ...	11,673·2	+ 2·1	51,384·2	+ 4·8
Public Lighting	203·1	+ 9·1	975·9	+ 8·5
Traction* ...	411·4	+ 2·8	1,690·9	+ 2·8
Total (millions)	22,986·2	+ 7·0	108,743·7	+ 9·7

* Excluding supplies for battery vehicles which are included under commercial or domestic.

F.B.I. Chief accuses G.A.T.T. Countries

Infringements of agreement alleged

ALLEGATIONS that Italy and Ireland were subsidising their exporters, in breach of the General Agreement of Tariffs and Trade, were made at Eastbourne last week by Sir Norman Kipping, Director-General of the Federation of British Industries.

He was speaking to the Export Council for Europe at their first general Convention, which was also addressed by the Prime Minister and the Chancellor of the Exchequer.

Sir Norman said that the two countries were engaging in practices clearly in breach of international agreements which had aroused "bitter hostility" from those who were suffering the consequence. He also hinted that remission of turnover tax in Germany—which in most cases was equivalent to the practice of freeing exports from purchase tax in this country—had in some cases become an actual subsidy. The subject of subsidies was important and it was satisfying to know it was under review in this country.

Veiled protection methods

There were still plenty of surviving quotas in Europe which served to keep British exporters out, Sir Norman told the Convention. However, protection did not exist in tariffs and quotas alone. There were regulatory devices in many fields existing under the guise of safety regulations which were quite clearly other methods of protection.

"Europe covers nine different sets of standards for electrical appliances and there are countless others for pharmaceuticals and foodstuffs. In some industries our adherence to inch measuration keeps us out of Europe and Europe out of Britain."

He pointed out that the six Common Market countries had made rapid progress among themselves towards complete standardisation of size and composition, which would effectively keep Britain out. "It is vital that we should be drawn into these arrangements before it is too late," said Sir Norman.

There was a need for a close examination of our Customs procedure. In this country, Customs examination had to take place at the dock and not the destination and this led to congestion in the ports. The Continental practice, on the other hand, was to make Customs examination at a large number of destinations, thus alleviating port congestion.

Chancellor praises Council

The Chancellor of the Exchequer paid tribute to the work of the Council and said that we could not force people abroad to buy British goods. They would only buy if they were available at the right price, quality and time. Mr Lloyd said there were often suggestions that existing inducements to export were insufficient and should be supplemented. There was, however, a system of rules prohibiting artificial aids to exports and, as a country highly dependent on foreign trade, the rules were to our advantage and it was better business for us to try and get the rules observed by others than to break them ourselves.

In the Prime Minister's speech to the Convention, he said that for each successive quarter during this year there had been an increase of exports to Western Europe over the previous year. During the first quarter it was up 9%, the second showed an increase of 16%, and the third an increase of 20%. In this time imports rose by 2%.

Sir William McFadzean, chairman of the Council, commented that the potential customer overseas was not primarily concerned with the detailed make-up of a tender, but whether the total price was better than any of the competitors.

MORE E.T.U. RULE CHANGES

A FURTHER major change in the ETU Rule Book was approved before the end of last week's Rules Revision Conference. This reduces the percentage of branch support needed in order to appeal against an executive decision from 10% to 5%, with the appeal going to the annual delegate conference, instead of a ballot of members as previously.

Members of the anti-Communist side, who have tried to stop these changes, believe that the alterations to the Rule Book will make efficient working of the executive, and administration of the union, a hopeless task.

The new rules became operative on 30 Nov., and now Mr F. Chapple is concentrating on an impending claim in the High Court to have the conference decisions declared null and void.

Mr F. Haxell, former ETU general secretary, who was held to have conspired to rig his election in December, 1959, has resigned from the Communist Party. Announcing this on Monday, the latter acknowledges that actions were taken at the Union's head office which "amounted to distorting the real position for the scrutineers . . . and this conduct gravely compromised the Party."

Better Lighting – Cheaper

A TOTAL of 106 Atlas "Super-8" fluorescent fittings provide an illumination level of 60 lumens/sq ft on the sales floor of the recently opened Gardners Supermarket in King's Road, Chelsea. The "Super-8" circuit incorporates two 8 ft 85 W tubes with special twin-start control gear, representing a total load of 22·6 kVA. Anticipated electricity bill for the scheme is £750 a year, compared with £1,150 if an equivalent installation of 5 ft 80 W fitttings, with a load of 37·5 kVA, had been used. The lighting was designed by Halpern and Partners in conjunction with the electrical division of Frederick Sage and Co.

Atlas "Super-8" lighting at Gardners Supermarket, Chelsea, saves £400 on annual running costs

Crabtree open London Showrooms

THE new London showrooms of Crabtree Electrical Industries Ltd., recently opened at 230 Tottenham Court Rd, W.1, incorporates a display of modern lighting fittings by C. M. Churchouse Ltd. and of wiring accessories and moulded circuit-breakers by J. A. Crabtree and Co. Ltd. A coded panel of "Closegang" switches provides individual control of each of the lighting fittings.

INVESTMENT POLICY DEBATED

HUNDREDS of millions of pounds was the talking point of MPs when, last week, they debated the recent White Paper on public investment. This official statement, noted in the ELECTRICAL TIMES for 2 November and 9 November, includes a limit for electricity supply investment in the coming year. Opening the debate, the Chief Secretary to the Treasury, Mr H. Brooke, said that the White Paper involved an increase of 5% in overall public investment.

The Financial Secretary to the Treasury added, in winding up the debate, that currently, public investment accounted for 40% of total fixed investment in the UK. He said that in 1961 the total investment would work out at 19% of gross national product, compared with something over 18% in 1960.

In the course of the debate, Mr B. de Ferranti, MP for Morecambe and Lonsdale, estimated that the electricity boards spent about £150 million on exportable equipment, while the industries supplying them exported £85 million worth.

He suggested that export performance could have been better, and would have been better, if the nationalised industry had had more understanding of manufacturing industry's problems.

Mr de Ferranti suggested that purchasing officers of nationalised industries chose the lowest tenders, but that frequently this was not the most economic way of purchasing equipment.

Accident Insurance for Nuclear Stations

THE CEGB is taking out insurance policies to cover its liability regarding accidents at nuclear power stations from the time when fuel is loaded into the reactor. These policies cover damage or injury to any person, whether an employee or not, and whether he or the property damaged by radiations is on the licensed site or elsewhere. Coverage amounts to £5 million in respect of each station, MPs were told last week.

Success for S.W.E.B. Heating Loan Scheme

FOLLOWING last week's news of the loans for electrical heating scheme launched by the Midlands EB comes a South Western EB statement that over 1,000 inquiries were received in the first month following the late-September start of a somewhat similar campaign. As a result, "well over 1,000 kW of additional off-peak load" was connected.

The SWEB scheme apparently differs from the MEB offer in putting more emphasis on off-peak heating. The plan is to provide tailor-made background heating for living rooms. For existing houses, block storage heaters are recommended. For bedrooms and bathrooms a direct-acting appliance is normally installed.

Terms offered by SWEB are no deposit, five years to pay, and interest at 5½%, for which income tax relief may be claimed. The five-year payment period is arranged under a personal loan scheme in conjunction with a private finance company.

FIRST TESCO DISCOUNT STORE OPENS THIS MONTH

WITH whispers going around the trade that the big American discount traders are itching to have a go here, the onslaught on resale price maintenance by British price-cutters is gathering pace and weight. Latest shock is the announcement by Tesco that they will open a 16,000 sq ft discount store at Leicester this month.

This store will not only be probably the largest in this country so far, but will be ideally situated on the ground floor of a new multi-storey car park, which is outside the main shopping area. About half the sales area will sell food, Tesco's usual line of business, but the remainder will cover a wide range of merchandise, including the lighter electrical goods. These will be set out on supermarket lines, so it will be the English version of a discount store rather than the bare-bones American pattern, which has now spread to Australia.

The leading appliance manufacturers are making all-out efforts to stop supplies from reaching discount traders, but there are some fears as to what might happen if the price-cutters were to start bringing in Continental goods. Meanwhile, new discount stores are opening each month, and at least one south coast retailer has opened a cut-price electrical department in his store.

Industrial Coal Prices Rising

PRICES of coal—other than that supplied to the domestic market—produced by the Scottish Division of the NCB will rise by an average of 10s/ton if the Coal Board's proposals are implemented. At the same time the Board proposes to increase the price of industrial coal from the North Western Division by 6s/ton.

These increases, say the Board, anticipate the deficit on the year's working in spite of increased output. The deficit is more than accounted for by the loss being made in the Scottish Division and the North Western Division. The Board claim that increased prices have been framed with the object of doing least harm to industry generally while, at the same time, yielding extra revenue from the coalfields and grades of coals which are making great losses.

During the Second Reading of the Coal Industry Bill in the Commons last week, MPs were told of the Minister of Power's proposal to make available a further £50 million for the Coal Board. This Bill is a temporary measure and is not an estimate of the deficits expected either this year or next year.

The Bill would give the Minister of Power authority to advance up to £50 million towards financing the Board's deficit at the end of next year. The total of the Board's borrowing limit remains at £700 million but this can, by order of Parliament, be increased to £750 million.

Both the Minister of Power and the Coal Board are convinced that the industry has reached a point where further general price increases would be most harmful. As well as increasing prices in the Scottish and North Western Divisions from 1 Jan., the Board is also proposing to increase throughout the country the price of the large grades of coal to non-domestic users.

C. A. Parsons' large transformer shop has been relighted by GEC. An overall level of 45 lumens/sq ft is achieved by using 56 1,000 W colour-corrected mercury vapour lamps, with existing GEC cold cathode fittings retained for the side lighting

Boards Responsible for Rural Supply

THE Parliamentary Secretary to the Ministry of Power told the Commons last week that the Government intended to stand firm by their principle of leaving the responsibility for rural electrification with area boards. He said that the boards had a dual responsibility under the Electricity Act (1957), first to further rural electrification and, secondly, at the same time, to make ends meet. It was up to individual boards to decide how swiftly rural electrification would be carried out and the Government had no intention of setting up a national scheme.

An allegation was made that 60% of rural dwellings in the SWEB area had no mains connection. The Parliamentary Secretary said the progress in the SW was relatively greater than in other areas.

MAGNET CASE CONTINUES

WITNESSES called on behalf of the Permanent Magnets Association have been giving evidence over the past few days in the hearing of the Association's case before the Restrictive Practices Court. A central point has continued to be whether the technical interchange and research activities of the Association would cease if the price-fixing agreements were abandoned by order of the Court.

The Association's director of research said that exchange of information would continue to some extent if the price ring were abolished, but it would be a long way short of the full collaboration that took place at present. He thought there was more world competition in permanent magnet developments than there was 25 years ago.

Customers as well as permanent magnet manufacturers have given evidence that they did not think there would be any advantage to them in the ending of the price agreement.

Sayings OF THE WEEK

"In many dwellings the sockets have obviously been located with a view more to saving wire than with the aim of putting them in the place where they are most likely to be needed." . . . The Ministry of Housing report, "Homes for Today and Tomorrow."

"We have moved to Scotland, and . . . I recommend this thoroughly to all other English industrialists who are thinking in terms of expanding their businesses and are looking not only for a beautiful place in which to put their factories but a part of the world in which people really work and which produces first-class workmanship and first-class goods." . . . BASIL DE FERRANTI, in the House of Commons debate.

PRICES of cable metals and other materials

Figures quoted are the official prices ruling on Tuesday, December 5

	£ per ton	Weekly change £
COPPER, standard class A (settlement)	228½	−¾
" (3 months)	228½	−¾
LEAD, refined pig, 99·97% purity (cash)	60½	−1½
" (3 months)	61½	−1½
TIN, refined, min. 99·75% purity (settlement)	952	—
(3 months)	960	—
ALUMINIUM, ingots 99·99·5% wire bars (4 × 4 × 54")	186	—
	193½	—
BRASS Strip 63/37	195½	—
SILVER (Troy oz)	86d	+6d

	£ per ton	Weekly change £
ZINC, virgin, min. 98% purity (cash)	70½	−1½
" (3 months)	71½	−1½
RUBBER, per lb		
No. 1, RSS, spot	23d	+⅛d
c.i.f. basis, ports, Feb.	23⅛d	+⅛d
ARMOURING:		
Galv. Steel Wire (0·104 in.)	68½	—
Mild Steel Tape (0·04 in.)	53½*	—
NICKEL (home)	660	—
MERCURY (76 lb flask)	59	—
AMERICAN PRICES:		
Copper, electrolytic (per lb)	31c	—
Lead (New York)	10½c	+¼c

** Tape Price, now an average, includes varnishing*

LARGE CONTRACTS AWARDED

THE flue dust monitors for West Thurrock and Rugeley stations are to be supplied by AEI Electronic Apparatus Division. Orders for 20 for each station have just been received from Babcock and Wilcox, and they are required for the main boiler construction programme commencing this month. The monitors will be similar to those already installed by AEI at Blyth "B," and will take a continuous recording of dust emission.

LARGEST ever to be built in Scotland, two synchronous motors worth £30,000 each have been ordered from Bruce Peebles by ICI. Of 5,900 h.p., 250 r.p.m., 11 kV, and unity power factor type, the motors will be used for ammonia production at ICI's Severnside plant.

MIDDLE EAST orders for J. G. Statter and Co., a member of the Metal Ind. Group, are £13,400 worth of extension switchboards for Kuwait, and a 22-panel h.v. switchboard valued at £19,000 for Baghdad. Another new order is four h.v. switchboards, worth £7,500, for the Port of Rangoon. More than 40% of Statter's production is exported.

CABLES for programming and sequential control in the tyre cord factory which Courtaulds are making for the USSR have been supplied by BICC. The circuits were run in multi-core twisted pair telephone type cables, and all types aggregated over 8,000 yd. The equipment went to Russia recently.

THOSE FAST CATS

SOME of the thrills associated with catamaran racing were outlined at last week's Batti-Wallahs' luncheon by Mr J. Fisk, who recently won the International Catamaran Trophy for the first time. In relating the events leading up to the challenge to US yachtsmen, the building and transport of the 24 ft craft and the ensuing races in Long Island Sound, in which he and his crew won four of the five races, Mr Fisk provided a tang of salty air much appreciated by his audience. Plans have been made for a return match next year on the south coast, we understand.

The next luncheon will be on 25 Jan.

HEAT treatment equipment worth over £100,000 has been ordered from Efco for the new Rootes factory at Linwood, Scotland. The factory will produce the small Hillman, and the orders include closed-quench furnaces as well as tempering and reheating furnaces, all electrically heated.

SHF radio equipment designed by GEC and recently supplied to the British PO and Canada has now been ordered by the Australian PO. One link will be between Sydney and Orange, for both-way telephony and one-way TV, and the other will carry TV from Brisbane to Mt. Matheson.

More Support for Fawley

ON the condition that assurances asked for from the CEGB were agreed to, Hampshire County Council last week endorsed the recommendation of the Planning Committee to support the building of an oil-fired generating station at Fawley. The Council were told that the Board had reduced the proposed site of the station from 200 acres to 138 acres which would now be outside the green belt.

News in Brief

The last d.c. consumer in Worthing was officially changed over to standard a.c. supplies recently.

It was a 225 MVA, 16/285 kV generator transformer for Kincardine power station which we illustrated last week, page 824, of course. The word "transformer," unfortunately, was missing.

The Minister of Housing and Local Government has a proposal by the GPO to establish their Central Engineering Training School at Harlow.

The report of the Committee on Consumer Protection is expected by the second quarter of 1962, MPs were told last week.

The EIBA has received £3,800 from the 1961 Electrical Industries' National Golf Championship.

Company Activities

TAKEOVER bids, excitement in silver following the US suspension of stockpile sales, strike and devaluation talk, conflicting views of the nation's export prospects and the repayment of yet another large amount, £50 million, of our International Monetary Fund debt —so the City never lacked talking points last week. On balance, it helped the market to go a little higher, with the *Financial Times* index of industrial ordinary shares rising from 295·2 to 298·2. Had it not been for the drag-weights of a cracked pay pause and the National Institute's gloomier view of the economic weather ahead, the optimism at the Eastbourne convention of the Export Council for Europe might well have taken the market back over the 300 mark. The seaside view was that Britain will become the seventh member of the Common Market "Six" and that Europe will provide the big booster we have so long been waiting for to get our exports off the ground. On the other hand, the back-room boys at the National Institute are inclined to believe the great European boom has been played out. Thus, while the industrialists are a'rarin' to go the theoreticians are having their doubts about it all. I am inclined to put my money on the seaside view and will be surprised if the market, too, does not opt likewise before very long.

It was also a lively week for the electrical share market, and although English Electric dropped 1s 9d to record a fresh 1961 "low" at 25s 3d. (GEC in sympathy shed 1s at 25s and AEI 1s 3d at 30s 3d) most of the smaller concerns were in fine form. Berry's Electric Magicoal, on the improved half-time figures and the "paused" same again interim of 10%, brightened from 62s to 64s and Crabtree, on the chairman's report, edged up from 24s 3d to 25s. Good demand for Thorn put the shares up from 60s to 64s and, likewise, Decca Ordinary were a firm spot, 2s dearer at 69s with the "A" rising from 65s 6d to 68s. Elsewhere, Murphy Radio on vague takeover rumours tuned up from 12s 4½d to 13s 3d, and Plessey finished the week 2s 3d richer at 46s. Granada's cinema and "Channel Nine" profits at £6·88 million against £2·68 million previously and the dividend rise from 36¾% to 90% lifted the "A" shares by a shilling a time to 61s 6d, although at this level they are still 5s 6d below their 1961 "high."

On the down-slope, Hoover saw its Ordinary shares dampen from 47s to 45s while the "A" were 6d easier at 43s 6d.

Then there were J. and F. Stone Lighting and Radio, the High St chain of electrical shops. Meeting shareholders for their yearly meeting, new chairman Mr Francis Bassett again denied that any takeover approach had been made to the company. "We are not seeking any and nor are we engaged in any negotiations or discussions on the matter," he told them. And so from 33s 3d at the start of the week the company's shares went into lower key to finish at 30s 9d. At the same meeting, joint-managing director Mr Stanley Usick was able to report a marked trend towards television set rentals, for which the company was making determined efforts to get its full share, and an increase in the company's new rental trade had already become apparent. On discount stores, Mr Usick pronounced that J. and F. Stone is well equipped to take advantage of this form of trading and that this market was being watched very closely.

And for its own special bid situation the electrical market, of course, had the Morgan Crucible/S. Smith and Sons (England)/Lodge Plugs affair. Morgan Crucible's 16s 6d a share bid, turned down by the Lodge board, has now been followed by an 18s offer from S. Smith. This it is prepared to offer pending the receipt of further information regarding the present position and prospects of Lodge. What say the Lodge board now? They reveal that merger talks between S. Smith's KLG Sparking Plugs offshoot and themselves have been taking place for a year and that arrangements have now been made to continue these discussions as a matter of urgency. And from these something more than an 18s cash offer may emerge. Shareholders are accordingly advised not to dispose of their shares. From 18s 7½d at the end of the previous week they have now eased to 18s 4½d, but it is early days yet and time enough for the fur and the sparks to fly.—*From our City Correspondent.*

Bennis Combustion

The 14 months to June, when a further group net loss of £8,657 was incurred, was one of transition, the chairman reports. Outstanding contracts which proved unprofitable were completed, and new work, including mechanical handling plant for a CEGB power station, was taken on on a more favourable basis. To limit financial commitments, the interest in the former Thermoflash subsidiary was sold.

English Electric

Permitted when the debentures are at or below par, market purchases of 4½% 1972-77 and 4% 1965-85 stocks have been chosen as the method for reducing the amount outstanding this year, so there will be no drawings. Purchases on this occasion are £225,050 nominal value of 4½% and £92,358 of 4%. This method of redemption follows the precedent earlier this year for other issues.

Kenwood

Preliminary results for the year to 31 July are better than might have been expected, if the managing director had not said in January that difficulties had been largely overcome, turnover was up and the outlook good. However, group earnings of £55,628 before tax for the 12 months are at least better than the £42,675 for the previous period, which included an extra nine months' trading of some subsidiaries. Crux of the matter is that having resumed dividends with a 7½% interim payment, directors now declare a final 5%, which due to a low tax charge is covered 1·6 times. The tax works out at £17,297, leaving a net profit of £38,331 against £9,393 previously.

Louis Newmark

First dealings are expected today in the shares of this company following a placement which brought Preference capital up to £250,000 and Ordinary to £375,000. An old family business originally importing watches, and still possessing sole UK concession for "Cyma" and "Avia," the company has in recent years been deriving about half its income from the manufacture of electronic and electromechanical instruments for quality and production control in industry, as well as automatic pilots and other aviation aids.

James Scott

A two-for-five issue is being offered at 20s per 5s share to shareholders registered on 27 Nov. Raising £463,987, the issue will be used to reduce overdraft and finance increased orders. Directors also announce a 5% interim dividend and expect to maintain the final at 22½% on the increased capital.

E. Shipton

Directors are satisfied that the year which ended on 30 Sept. last will show a substantial turn-round in the group's fortunes, Sir Leslie Nicholls, chairman, said at the opening of the new communications and automation centre at Africa Hse, Kingsway. Sales both in the communications and the plastics divisions were more than double the previous year.

Strand Electric

The chairman does not promise a record every year, but he sees no reason why 1962 should not be at least as good as 1961. On the Common Market, he told the a.g.m. that entry should help the company, but if at the expense of Commonwealth interests, the board would prefer not to join.

Dividends Announced

Berry's Electric. Interim 10% (held to previous year's equivalent due to "pause").

Johnson Matthey. Interim 5% (last year 3%), reducing disparity from final.

B. S. and W. Whiteley. Interim 10% (*same*).

Telephone Rentals. Interim 5% (previous equivalent 4½%).

OVERSEAS NEWS

from our correspondents abroad

CANADA

Back-pressure sets

An order for two 30 MW steam-turbine generator sets has been awarded to the Canadian Westinghouse Co. by Dow Chemical of Canada Ltd. For installation early in 1963, the machines are back-pressure units to generate electricity from process steam.

ARGENTINA

Reorganisation Plan

The Pinedo Plan, which provides for the reorganisation of the electricity services of Greater Buenos Aires, has been approved by the Argentina Government. A decree recently issued provides for the purchase by the Government of the SEGBA "B" shares outstanding by foreign loan bonds. SEGBA will take over and operate the new South Dock plant and it is hoped that the World Bank will make a loan of $50 million to $60 million, which will be used towards the payment for that plant which is being supplied from Britain. It is understood that the US Export-Import Bank will provide a credit of $13·2 million to SEGBA for the purchase of a new turbo-generator for the Greater Buenos Aires power station.

EUROPE

Power Export

The latest European power export to be arranged is between Spain and France. Under an agreement recently approved by the Government of Spain, the Spanish Empresa Nacional Hidro-electrica de Ribargorzana will provide up to a maximum of 2,000 million units/annum to Electricite de France over a period of five years. The arrangement will involve the establishment of the necessary transmission line.

ISRAEL

Potash and Power

The Dead Sea Works Ltd., of Israel, are likely to seek international tenders very shortly for the construction of a dam which, together with secondary dams, will enclose an area of 100 sq km of evaporation pans on the southern shore of the Dead Sea. The company is also planning the erection of a power station for its own requirements, with a generating capacity of around 12 MW, which, in addition, would provide process steam. The station would operate on natural gas piped from the Rosh Zohar gas wells. The company were recently granted a $25 million loan by the World Bank.

INDIA

Inter-State Grid

Survey work for the construction of Inter-State transmission lines for connecting the power grid of Kerala with that of Madras under the scheme for a common grid for the States in the South Zone is proceeding well. The plan is to connect the Pamba power house in the State to a point on the border with Madras State by 220 kV lines, a distance of some 30 miles. A similar scheme to link Madras and Mysore has just been approved, involving another section of 220 kV line, which it is hoped will be erected by the middle of next year.

Russian Plant

At the request of Machino Export, of Moscow, the Madras State Electricity Board has agreed to send its chief engineer, Mr V. P. Appadurai, and its executive engineer, Mr A. P. Sreshta, to the USSR to settle outstanding issues regarding equipment being supplied for the Mettur Tunnel power station. The USSR are supplying the generators, turbines, transformers, switchgear and other equipment. Cost of the two-week visit is to be borne by Machino Export.

PAKISTAN

Research Labs. Approved

The establishment of a research and testing laboratory for electrical equipment has been approved by the Government of Pakistan. The laboratory, to cost Rs 47 lakhs, has been proposed by the Water and Power Development Authority, for the testing of both imported and locally manufactured electrical goods. Until now, the Authority's Electricity Department have had only a small laboratory for testing of meters and for minor tests on transformers and switchgear.

Fluorescent Tube Plant

The first fluorescent tube factory in Pakistan is expected to be in operation at Hyderabad by the end of this year. It is being established jointly by Kimoto and Nichiemen, of Japan, and Humayoon Industrial Corporation Ltd., of Pakistan, and is expected to produce about 600,000 tubes annually.

BORNEO

More Diesels

Further diesel generating plant for the North Borneo Electricity Board is on order from the English Electric Co. These latest sets are for installation at Jesselton and Tawau, and the company have promised delivery next September, according to Mr E. H. Walker, general manager of the Board. The annual report of the Board for 1960, just published, indicates that there is considerable difficulty in meeting the increasing demands for electricity. Operations for the year brought earnings of $2,708,813 (compared with $1,954,580 in 1959), but expenditure also rose to $2,598,029. But for the remission of duty on fuel and oil, amounting to $110,300, the Board's position would have been very difficult, it is stated. Delay in delivery of a generating set for Sandakan adversely affected the economy of the undertaking and resulted in a heavy loss in that area. There was also some delay in delivery of new generating sets for other sites. But Mr Walker reports that electricity consumption is increasing in many areas and the Board hopes that future developments will lead to a greater use of electricity during the day-time.

AUSTRALIA

Next Station

Torrens Island has sufficient area and natural facilities to meet the future requirements for conventional and nuclear power stations of the Electricity Trust of South Australia, the Premier, Sir Thomas Playford, stated last month in announcing a new £800,000 cash loan for the Trust. The latter are expected to make their recommendations shortly on the suggestion for a station of at least 1,000 MW on Torrens Island, to which we referred on 19 Oct. Sir Thomas said Torrens Island was expected to be the site for the Trust's next station, for which the first machine, to be installed in 1967, would be of 120 MW, but subsequent machines would be of 200 MW and probably 350 MW. Torrens Island provided an ideal location because cooling water could be drawn from the Port River on one side of the island and discharged into the North Arm on the other.

HONG KONG

Another Set

Another 60 MW turbo-generator, with condensing plant, deaerator and auxiliaries, has been ordered by the China Light and Power Co. for its Hok-Un power station in Hong Kong. This is the third set of this size to be ordered from AEI (we reported last week the arrival of the second machine). With this further set, the total capacity of the station will be 362·5 MW. Steam conditions of the three 60 MW machines are 915 p.s.i. 900°F.

COMMERCIAL INFORMATION

Contracts Open at Home . . .

Dates given are the final for receipt of tenders unless otherwise stated.

7 Dec.—Leeds. Electrical work, on fixed-price basis, in new nurse training unit, Menston Hospital. Applications, enclosing £2 2s deposit, to Regional Engineer, Regional Hospital Board, Park Parade, Harrogate, by 12 noon on above date.

8 Dec.—Bristol C.C. Electrical installation, on fixed-price basis, in new 87,000 sq ft Hartcliffe Secondary School for Girls. Applications to City Architect, Council Hse, by above date. N.I.C. firms only.

8 Dec.—Dunbarton C.C. (3) Electrical work in new Technical College, Clydebank. Applications to County Architect, J. Miller, Ferry Rd, Old Kilpatrick, by above date.

8 Dec.—Potters Bar U.D.C. Rewiring of 50 houses in Cranbourne Rd.—Advertised 23 Nov. issue.

9 Dec.—Bideford B.C. Supply and erection of 25 Group "A" street lighting units along A386. Borough Surveyor, H. J. Denne, Municipal Bldgs. Deposit £1 1s.

9 Dec.—Bootle B.C. Supply: cables, electrical goods and lamps.—See 30 Nov. issue.

9 Dec.—Pomeroy. Installation of Selex heat/light units in All Saints' Church, Townland of Crossdernott, Donaghmore.—See 30 Nov. issue.

9 Dec.—Seaton Valley U.D.C. Electrical installations in 32 houses at Seghill.—See 16 Nov. issue.

11 Dec.—Chelmsford B.C. Provision and erection, on fixed-price basis, of 107 Group "B" columns, lanterns and gear in St. John's Rd area.—See 23 Nov. issue.

11 Dec.—Cornwall C.C. Applications invited for inclusion in approved list for electrical installations and lifts.—See 30 Nov. issue.

11 Dec.—Darlington B.C. Electrical installations in 46 houses on Firth Moor estate.—See 23 Nov. issue.

11 Dec.—Renfrew C.C. (3) Electrical installation in Donaldswood R.C.J.S. School, Paisley. Applications to County Clerk, R. Urquhart, County Bldgs, Paisley, by above date.

11 Dec.—Tunbridge Wells B.C. Supply and erection of 33 Stewart and Lloyds 25 ft steel columns, G.E.C. lamps and lanterns, together with ancillary works for Group "A" lighting along Lansdown Rd and Sandrock Rd.—See 30 Nov. issue.

11 Dec.—Wallasey C.B.C. Electrical installations in three blocks of five-storey flats and maisonnettes.—See 23 Nov. issue.

11 Dec.—Wigan R.D.C. Erection of 255 Class "B" concrete columns and fluorescent lamps/fittings in various parishes.—See 30 Nov. issue.

13 Dec.—Keynsham U.D.C. Provision and installation of two 180 g.p.m. sewage pumps with motors for Norman Rd housing estate.—See 16 Nov. issue.

13 Dec.—Newcastle upon Tyne C.C. (3) Electrical installation in 360-pupil Charles Trevelyan County Primary School, Cruddas Pk. Applications to City Architect, 18 Cloth Market, by above date.

14 Dec.—Cardiff C.C. Electrical installation, on fixed price basis, in Blackweir Ambulance Station. City Surveyor, City Hall. Deposit £2 2s. N.I.C. firms only.

15 Dec.—Antrim C.C. (a) Electrical installation in Buick Memorial Primary School, Cullybackey.—See 30 Nov. issue.

15 Dec.—Beddington and Wallington B.C. Supply and erection of 326 Group "B" Stanton concrete columns/brackets and 60 W Revo lanterns, sodium lamps/gear.—See 30 Nov. issue.

15 Dec.—Breconshire C.C. Electrical installation in 64,500 sq ft five-stream Comprehensive Mixed School, Brymawr. Applications to County Architect, Rhyd Offices, Brecon, by above date. Deposit £2 2s made payable to C.C.

15 Dec.—Leeds C.C. Trunk road and roundabout lighting: (Contract 3A) supply of 11 35 ft reinforced concrete columns/brackets; (3B) supply of 11 200 W sodium lamps/lanterns/gear; (4A) supply of 26 25 ft reinforced concrete columns/brackets; (4B) supply of 140 W sodium lamps/lanterns/gear.—See 23 Nov. issue.

15 Dec.—Neston U.D.C. Provision and erection, on fixed-price basis, of 48 street lamps. Engineer/Surveyor, Town Hall, Neston, Wirral.

15 Dec.—Sowerby Bridge U.D.C. Re-wiring and additional installations in Westfield Hse. Engineer and Surveyor, Beech Royd, Beech Rd. Deposit £2 2s.

16 Dec.—Girvan B.C. Supply and fitting of electrical striking movement for town steeple clock and for the replacement of the south dial.—See 23 Nov. issue.

16 Dec.—Plympton St. Mary R.D.C. Installation of 75 street lighting columns and 80 W m.v. control gear at Stentaway estate, Plymstock.—See 23 Nov. issue.

18 Dec.—E.B. for N.I. Specification 1642. Lighting and heating associated with No. 4 boiler and turbo-generator at Coolkeeragh.—See 2 Nov. issue.

18 Dec.—Kildare C.C. Electrical installation comprising 73 lighting and nine socket outlet points together with three storage heaters for nurses' and maids' accommodation at County Hospital, Naas. Details from consulting engineer, Eoin Kenny, 44 Kildare St, Dublin. Deposit £5 5s.

18 Dec.—Southampton C.B.C. Electrical installation in College of Technology.—Advertised 2 Nov. issue.

18 Dec.—Tonbridge U.D.C. Supply and erection of sewage pumps: two 300 g.p.m. at 28 ft head; two of 450 g.p.m. and two of 900 g.p.m. at 42 ft heads.—See 16 Nov. issue.

18 Dec.—West Riding C.C. Rewiring of 2 to 8 Bond Terr, Wakefield.—See 23 Nov. issue.

18 Dec.—West Wilts Water Board. Supply of one 233 g.p.m. at 160 ft head submersible pumping unit. Engineer and Manager, J. A. Young, 55 Boreham Rd, Warminster.

19 Dec.—Abergele U.D.C. Installation of 176 140 W sodium and 13 250 W mercury lighting points in Water St and Dundonald Ave, Abergele; Marine Rd and Towyn Rd, Pensarn; Towyn Rd, Towyn; and Foryd Rd, Kinmel Bay.—Advertised 30 Nov. issue.

19 Dec.—Mynyddislwyn U.D.C. Erection of columns, supply and erection of brackets/sodium lanterns/lamps/gear and wiring complete, on fixed-price basis, of 1¼ mile of Group "A" lighting, Plough Inn, Penmaen Rd to Penmaen.—See 30 Nov. issue.

20 Dec.—Manchester C.C. Electrical installation in Miles Platting Secondary School.—See 30 Nov. issue.

27 Dec.—Ealing B.C. Electrical installation renewal in Selborne Primary and Secondary School, Conway Cres, Greenford.—Advertised 30 Nov. issue.

28 Dec.—Belfast C.C. (b) Electrical installation in proposed extensions to Graymount Open Air School, Gray's La. City Architect's Dept., 40 Academy St.

28 Dec.—Pontypool U.D.C. Provision, installation and bringing into service of 450 200 W sodium lamps/lanterns/steel columns, together with cabling.—See 30 Nov. issue.

29 Dec.—Braintree and Bocking U.D.C. Group "B" lighting: (1) erection of 81 Group "B" concrete columns; (2) supply/erection/wiring of 78 sodium lanterns; (3) supply/erection/wiring of four fluorescent lanterns; (4) cable laying; (5) removal of existing installations. Engineer, Town Hall, Braintree. Deposit £2 2s.

29 Dec.—Camberwell B.C. Supply of (List K) lamps and (S) fittings, cables and conduit.—See 30 Nov. issue.

29 Dec.—Reigate B.C. Supply of (list h) electrical fittings and requisites. Borough Engineer, Town Hall.

30 Dec.—Romford B.C. Supply: lamps.—See 30 Nov. issue.

1 Jan.—Buntingford P.C. Supply and erection of 18 columns with 140 W sodium lighting on A10. Clerk, A. P. Westover, Sandon La. Deposit £2.

1 Jan.—Co. Down. Electrical installation in new school at Lurganville. Details from Houston and Beaumont, 9 Market St, Lurgan, Co. Armagh. Deposit £3 3s.

1 Jan.—Ilford B.C. Supply of (list 7) cables and (list 16) lamps for year to 31 March, 1963. Borough Engineer and Surveyor, Town Hall.

2 Jan.—Belfast C.C. Supply of: (Form A9) insulating materials; (A.16) trolleyhead spares; (A19) carbon brushes and carbon inserts; (A30) battery spares; (A35) o/h line equipment; (A37) rheostats; (A40) trolley wire; (A41) spares for GEC trolleybus equipment. Transport Dept., Sandy Row Depot, Belfast 12.

2 Jan.—N.I. Hospitals. (3) Electrical services

Your Queries Answered

Readers are invited to make use of our free enquiry department which possesses wide resources, including an index of trade information with over 100,000 entries

A Selection from the 113 queries answered this week

"Mypol" domestic floor polishers—makers of? R.G.—Dowding and Plummer Ltd., Calthorpe Hse, Stockfield Rd, Acock's Green, Birmingham 27.

"Mobrey" automatic control equipment—makers of? T.E.—Ronald Trist and Co. Ltd., 6 Upper Thames St, E.C.4.

"Viscap" skullcap type protective sealing hood for blanketing off agents in bottles—makers of? W.H.—Viscose Development Co. Ltd., 40 Chancery La, W.C.2.

"Lance" split transformer type safety lock system for machine guards—makers of? C.P.C.—Lance Engineering Co. Ltd., 18 Milton St, Nottingham.

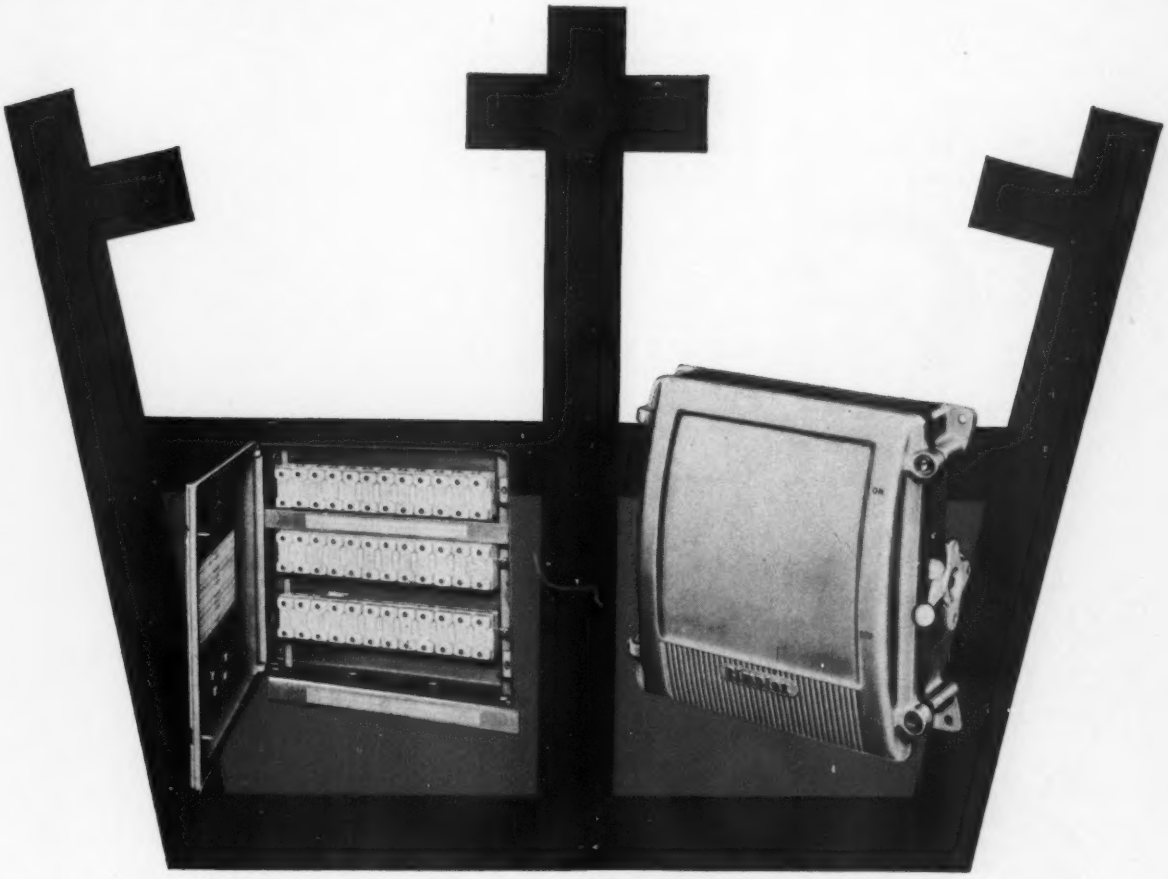
"Cheeto" food mixers—makers of? S.W.E.B.—Howard Foss Ltd., Belvedere Wks, Totton, Southampton.

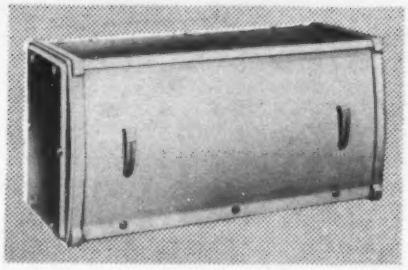
"Dzus" fasteners—makers of? S.R.—Dzus Fastener Europe Ltd., Farnham Factory Estate, Guildford Rd, Farnham, Surrey.

"Bandalasta" translucent plastics mouldings—makers of? A.M.—Brookes and Adams Ltd., Barr St, Birmingham 19.

"Yelsen" toasters—address for? T.E.—Morphy-Richards (Cray) Ltd., 50 Conduit St, W.1.

"Welmet" resistances—makers of? W.H.—Welwyn Electrical Laboratories Ltd., Bedlington, Northumberland.





SIMPLEX REGENT SWITCHGEAR PART OF THE COMPREHENSIVE MEDIUM VOLTAGE SIMPLEX RANGE OF SWITCHGEAR

The sturdy, stylish Regent range of switches, switchfuses, and changeover switches are conventionally constructed to meet a very wide range of requirements. The casings are weatherproof and dust protected as defined in BS 861 and 2510. All units are HRC or rewireable — fuses completely interchangeable.
Sealing chambers and glands for Regent switchfuses are made for any type and size of normally used cable, either straight or reverse entry without drilling.
The entire Simplex Regent range is suitable for lighting, heating and power loads without de-rating.
Switches, switchfuses, changeover switches 15, 30, 60 and 100 amp. 500 volt.
Busbar chambers 350, 550, 800 amp. 600 volt.
Distribution fuseboards 15, 30 amp. 500 volt.

Simplex

ELECTRICAL DIVISION

SIMPLEX ELECTRIC COMPANY LIMITED
CREDA WORKS BLYTHE BRIDGE STOKE-ON-TRENT STAFFS

Branches throughout Great Britain and Agents throughout the World

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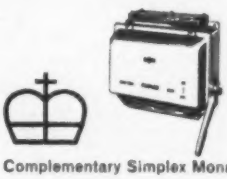
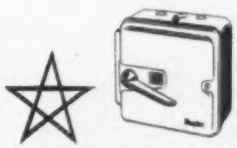


Complementary Simplex Monarch range. Heavy duty fuse switches, suitable for all lighting, heating and power loads without de-rating. 150, 300 amp. 500 volt.



Complementary Simplex Star range. Economically priced, front operated switchfuses in 15, 30, 60 amp. 500 volt. Busbar chambers 200, 400, 600 and 800 amp. 600 volt. Distribution fuseboards 15, 30, 60 amp. 500 volt.

Man with an enquiring mind . . .

takes note of current affairs.

Takes note, most likely, of an electricity meter made by Ferranti. And what, you may say, is so special about that? Its complete, unwavering accuracy? Its silent devotion to duty? The way it keeps on keeping on? All this, and more, much more. Ferranti, as a matter of fact, started making meters nearly 80 years ago. They had to . . . to measure the bulk supplies of electricity which had become available as a result of the pioneering work of Dr. S. Z. de Ferranti.

Ferranti, in a word, make the best meters—and more of them, for home and export markets. Meters the size of filing cabinets, meters no bigger than a box-camera. Meters that hide in cupboards; giant summation meters for great power projects like the Kariba Dam; meters for the National Grid. Currently Ferranti are spending £200,000 on new meter plant installations aimed to increase out-put by 30%. And always, the experts at Ferranti are working to increase efficiency and cut costs.

Like Ferranti meters, Ferranti electrical and electronic products are to be found all over the world—in engineering, the aircraft industry, scientific and business organisations. And everywhere, in all their uses, they are leading the way to a better life.

FERRANTI

First into the Future

FERRANTI LTD., Head Office: HOLLINWOOD, LANCS. London Office: KERN HOUSE, 36, KINGSWAY, W.C.2

PG 349/2

in the provision of annexes to Wards 4 and 8B at Whiteabbey Hospital. Details from Quantity Surveyor, A. G. Crawford, 12 Donegall Sq West, Belfast 1. Deposit £3 3s.

5 Jan.—Wanstead and Woodford B.C. Supply of (item 12) lamps for year. Borough Engineer and Surveyor, Municipal Offices, E.18. 6d s.a.e. required.

8 Jan.—Blackpool C.B.C. Supply of street lighting equipment: (A) 60 Group "A" spun concrete columns, fluorescent lanterns/gear and solar dial time switches; (B) 120 Group "B" concrete columns/fluorescent lanterns/brackets/gear; (C) 760 "A," "B" and intermediate concrete columns and 110 6 ft concrete extensions for Group "B" columns, 970 fluorescent lanterns including post top and timeswitches; (D) 80 2 ft concrete extensions, Group "B" fluorescent lanterns/gear and timeswitches. Director of Lighting and Electrical Services, Rigby Rd East, Blackpool.—Advertised in this issue.

8 Jan.—Nottingham C.C. Two centrifugal pumps complete with motors, switchgear, etc., for Newstead. Engineer and General Manager, B. W. Davies, Water Dept., Castle Boulevard. Deposit £1 1s.

10 Jan.—Southport C.B.C. Sub-contract 3. Electrical installation in Canning Rd Bus Depot extension.—See 23 Nov. issue.

15 Jan.—Bermondsey B.C. Supply: lamps. —See 30 Nov. issue.

5 June—Campbeltown. N.A.T.O. Infrastructure contract, value £50,000, including flameproof gear for P.O.L. storage depot for power distribution and control, exterior lighting, installations including lighting in buildings, pipeline heating, earthing and bonding.—Advertised 23 Nov. issue.

27 Jan.—Camborne-Redruth U.D.C. Supply of (Schedule 24) electrical equipment and fittings for year to 31 March, 1963. Clerk: S. C. Wilson.

No date stated—N. of Scotland H.E.B. 30 MVA transformer for Charleston Substation, Dundee, and 60 MVA transformer for Glenagnes Substation, Dundee. Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3. Deposit £2 2s each transformer.—Advertised in this issue.

. . . and Overseas

*Details of items marked * may be obtained on application to the Board of Trade, Lacon Hse, Theobalds Rd, W.C.1, quoting reference.*

12 Dec.—India. 66 and 33 kV lightning arrestors. Chief Engineer, Electricity, Purchase Section, Mysore S.E.B., P.B. 15, Bangalore. B.o.T. (ESB/36380/61).*

12 Dec.—Singapore. 25,000 house service meters. City Council, Electricity Dept. B.o.T. (ESB/36375/61).*

13 Dec.—Pakistan. Cables (16 items). Chief Controller of Purchase, Pakistan Western Railways, Empress Rd, Lahore. B.o.T. (ESB/36625/61).*

15 Dec.—Thailand. 540 capacitors from 3 to 25 kVAr. Provincial Electricity Authority, Sam-Sen. B.o.T. (ESB/36613/61).*

18 Dec.—Pakistan. 50/60 kW diesel alternator and switchboard. Mr F. Rizwi, Purchase Co-ordinating Officer, Block 32, P. and T. Directorate-General, Karachi. B.o.T. (ESB/36384/61).*

18 Dec.—Thailand. 150,000 metre all aluminium seven-strand No. 2 A.W.G. and accessories (seven items). Provincial Electricity Authority, Sam-Sen. B.o.T. (ESB/36612/61).*

19 Dec.—Argentina. 33 kV transmission line between Gonzalez Chaves and Tres Arroyos. Direccion de la Energia (D.E.B.A.), Ministerio de Obras Publicas, La Plata, Prov. de Buenos Aires. B.o.T. (ESB/35782/61).*

20 Dec.—Burma. 125 mercury vapour 125 W lamps, lanterns, gear. Director-General, Union of Burma Purchase Board, St. John's Rd, Rangoon. B.o.T. (ESB/36655/61).*

20 Dec.—India. Metering panels. Chief Engineer, Electricity, Purchase Section, Mysore S.E.B., P.B. 15, Bangalore 1. B.o.T. (ESB/36381/61).*

23 Dec.—Pakistan. Aerial cable 6, 10 and 20 pair. Mr F. Rizwi, Purchase Co-ordinating Officer, Block 32, P. and T. Directorate-General, Karachi. B.o.T. (ESB/36386/61).*

24 Dec.—Kuwait. Tubular cable lugs and line taps. President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/36910/61).*

29 Dec.—Portuguese East Africa. Electrical equipment. Ports, Railways and Transport Dept., Lourenco Marques. B.o.T. (ESB/36091/61).*

30 Dec.—India. 57,000 ft h.t. armoured cable and 125,000 ft l.t. armoured cable. General Manager, Singareni Collieries Co. Ltd., Kothagudium Collieries P.O., Bhadrachellam Rd Station, Central Railway, Deccan. B.o.T. (ESB/36952/61).*

31 Dec.—Kuwait. 27 diesel alternator sets from 30 to 200 kVA. President, Dept. of Electricity, Water and Gas. B.o.T. (ESB/36909/61).*

1 Jan.—Iraq. Transformer substations for camps at Mussaib, Mahawal and Dewaniyah. Directorate of Military Work, Baghdad. B.o.T. (ESB/36328/61).*

5 Jan.—India. Four 7·5 MVA, three 5 MVA and three 1 MVA transformers. Superintending Engineer, Technical (Electrical), 10-2-3 A.C. Guards, Khairatabad P.O., Hyderabad 4, Andhra Pradesh. B.o.T. (ESB/36374/61).*

12 Jan.—India. 785-mile a.c.s.r. conductor. Chief Engineer (South), Stores Purchase Section, Punjab S.E.B., The Mall, Patiala. B.o.T. (ESB/36668/61).*

19 Jan.—New Zealand. 12 230 V contact voltmeters. Director-General (Stores Division), G.P.O., Wellington. B.o.T. (ESB/36388/61).*

24 Jan.—Iraq. Ring main h.t. distribution system at Habbaniya Military Camp. Ministry of Defence, Baghdad. B.o.T. (ESB/36329/61).*

14 Feb.—Malaya. Aerodrome and street lighting installations for new International Airport to be located 11 miles west of Kuala Lumpur. Director of Civil Aviation, Kuala Lumpur. B.o.T. (ESB/36628/61).*

20 Feb.—New Zealand. Two 200/60/200 MVA 16/33/220 kV T.C.O.L. interconnecting transformer banks and spare unit for Benmore Power Station. Secretary, Tenders Committee, N.Z. Electricity Dept., Wellington. B.o.T. (ESB/36389/61).*

26 Feb.—Australia. 132 kV cabling for White Bay/Rozelle/Homebush. Manager and Secretary, E.C. of N.S.W., Box 5257, G.P.O., Sydney. B.o.T. (ESB/36669/61).*

CONTRACTS PLACED

Barnsley B.C. Electrical installation in new police H.Q., T. W. Broadbent Ltd.

Belfast. Electrical installation in Electrical and Mechanical Bldg, Queen's University, B. French Ltd.

Brentford and Chiswick B.C. Supply and erection of lighting along Chiswick High Rd, Atlas Lighting Ltd., £4,280. Recommended.

Ellesmere Port B.C. Provision and erection of 38 Group "A" and 146 Group "B" street lighting units, Concrete Utilities Ltd., £5,409.

Honiton B.C. Electrical installations in council houses, R. T. Delve, £2,485. Recommended.

Hull C.C. Electrical installations in: 219 dwellings, Boothferry estate, Reliance Electrical Co.; 62 dwellings, Hebden Ave and Holderness Rd, G. T. Spaven (Bridlington) Ltd.; 113 dwellings, Boothferry estate, Hobson and Scott Ltd.

GAZETTE ANNOUNCEMENTS

COMPANIES ACTS

Lee Guinness Ltd. First meetings of creditors and contributories to be held at Room 401, Inveresk Hse, 346 Strand, W.C.2, on 12 Dec., at 3.30 and 4 p.m., respectively.

Wm. B. Abel and Son Ltd. Dividend per £: 2s 9d, payable at offices of E. T. Collins and Son, 28 Baldwin St, Bristol 1, on 11 Dec.

Bestfriend Electrical Co. Ltd. Meeting of creditors to be held at offices of MacIntyre Hudson and Co., Craig's Court Hse, 25 Whitehall, S.W.1, on 12 Dec., at 11 a.m.

Permacold Refrigeration Ltd. Liquidator: G. F. Morris, Inveresk Hse, 346 Strand, W.C.2, released as from 26 Oct.

Ratcliff (Electric) Ltd. Creditors to send details to liquidator: P. Cardwell, 93 Queen St, Sheffield 1, by 31 Dec.

BANKRUPTCY ACTS

Receiving Orders

Bristol. B. D. Toon and T. E. Poole, electrical dealers, formerly carrying on business in partnership as Keverley Services at 625 Bath Rd, Brislington; 123 Grosvenor Rd, St. Paul's; Ashley Rd and Boar's Head Yard, St. George's Rd, Bristol. Receiving order dated 20 Nov.

Burton upon Trent. P. K. W. Toon, electrical contractor, carrying on business at 47 Hawfield La, Winshill. Receiving order dated 20 Nov.

Halifax. J. Priestley and D. Hutchinson, appliance retailers and repairers, carrying on business as Electrical Enterprises at 90 Southgate, Elland; and 110 Commercial St, Brighouse. Receiving order dated 23 Nov.

Appointment of Trustee

Nottingham. D. Martin and M. Martin, radio and electrical engineers, carrying on business at 13 Rose Cottages and Meadow La, Burton Joyce. Mr R. C. Turton, 91 Talbot St, Nottingham, appointed trustee as from 21 Nov.

Intended Dividends

Bangor. L. Nadin, radio, television and electrical retailer, formerly carrying on business at Llandudno, Penmaenmawr, Colwyn Bay and Llanrwst. Last day for receiving proofs for intended dividend: 14 Dec., by trustee: R. A. Hawken, Bank Chmbrs, 1 John St, W.C.1.

Chesterfield. R. Powell, electrical retailer, formerly carrying on business as Domestic Electrics at 127 Newgate La, Mansfield. Last day for receiving proofs for intended dividend: 13 Dec., by trustee: K. A. Miller, 3-7 Holy Green, The Moor, Sheffield.

TRADE NOTES

Changes of address. The Southampton branch of Walsall Conduits Ltd. has moved to 57-59 Castle Way, Southampton. Telephone No. 27161.

The Martindale Electric Co. Ltd. have moved to Movitex Hse, 6 Empire Way, Wembley. Telephone: Wembley 3041. The factories, design and development section remain at their present address.

The Luton branch of British Insulated Callender's Cables Ltd. has recently moved to Cradock Rd, Skimpot Rd, Luton. Telephone: Luton 52484.

Rejafix Ltd. are moving on 10 Dec. to Harlequin Ave, Brentford, Middx. Telephone: Isleworth 2224.

Australian tariffs. Among changes announced by the Australian Department of Customs and Excise, thermistors now carry a duty of 2s 6d each or 27½% *ad valorem*, whichever rate returns the higher duty.

Change of name. As from 1 Jan., 1962, the title of Mirrlees Bickerton and Day Ltd. will be changed to Mirrlees National Ltd., to whom will also be transferred the undertakings of the National Gas and Oil Engine Co.

New showrooms. Ronson Products Ltd. have opened new showrooms at 388 Strand, W.C.2, for demonstrating their growing range of electrical goods.

BUSINESS PROSPECTS

Accrington. Bank and offices, King's Hall Cinema site, proposed by Lloyds Bank Ltd., 71 Lombard St, E.C.3.

Aylesbury. B.C. propose five small factories, Stocklake industrial estate.

Barnsley. B.C. propose 100 old people's dwellings, costing £165,000, St. Helen's site; Engineer.

Basildon. Factory planned at Industrial Area No. 2, New Town, for H. Sims and Co. Ltd., Bowlers Croft, Basildon.

Bath. Multi-storey car park to cost £200,000 proposed, Walcot St, by Multidek Car Park Ltd., 8 Clarges St, W.1.

Bedlington. J. T. Bell and Sons, Market St Chmbrs, Newcastle, propose shops/flats, Wansbeck East estate.

Billingham. U.D.C. propose second shopping block in town centre costing £125,000. Architects, Elder and Lester, Midland Bank Chmbrs, Town Sq.

Blackpool. Fylde Hospital Management Committee propose ten-year programme of extensions, to cost £2 million, Victoria Hospital, Whinney Heys. Sir Lindsay Parkinson Group, 6 Lambeth Rd, S.E.1, propose large block of flats, Queen's Promenade and Wilvere Dr.

Brighton. Proposed: three-storey extension to Robert St Printing Wks, for Southern Publishing Co. Ltd., 50 North St; a factory, The Hyde industrial estate, Lower Bevendean, for Walter and Lynn Ltd., Jubilee St. Proposed: four-storey development of 23 shops, 12 maisonnettes, car park and stores, Brighton Pl and Meeting Hse La, for Hanningtons Ltd., North St.

Bromley. Property Investments Consolidation Ltd. propose redevelopment of two-acre island site, Bromley South Station; architects: Alun Jones and Allerton, 1 Clement's Inn, Strand, W.C.2.

Camberley. Proposed: £500,000 department store for William Harvey of Guildford Ltd.; architect: Robert J. Cole, 10 King's Ride, Camberley.

Cranford. Corob Holdings Ltd., 7 Hill St, W.1, propose 1½ acre site, Bath Rd and Gt. South West Rd, for redevelopment.

Croydon. Planned: factory, Gloucester Rd, for John Norman Ltd., 97 St. John's Hill, Clapham Junc., S.W.11. Proposed: old people's homes of 59 beds each, Monks Hill and New Addington estates. Proposed: office block, Wellesley Rd and Walpole Rd, for Plinth Property Investments Ltd., c/o Newman, Levinson and Ptnrs., architects, 9 Mansfield St, W.1.

Cumberland. C.C. award contract for second instalments for Hensingham Junior and Distington Infants' Schools to Border Engineering Contractors, Queen St, Whitehaven.

Darlington. B.C. propose new municipal buildings. Borough Architect.

Doncaster. Proposed: £190,000 factory, Wheatley Hall Rd, for Montagu Burton Ltd., Hudson Rd Mills, Leeds; contractors: M. Harrison and Co. (Leeds) Ltd., Farnley. John Todds, Stockton, propose between 300 and 400 dwellings, Sprotsborough Pk; civil engineers: Grantham Blundell and Farran, 20 South Parade.

Durham. C.C. propose alterations to Wolviston County School and alterations and additions to Annfield Plain Girls' and Boys' Modern School; County Architect.

Eastleigh. Shopping and residential development, Winchester Rd, proposed by Town and City Properties Ltd.; architects: Ian Fraser and Assoc., 15 Bedford St, W.C.2.

Ely. C.C. propose 70 dwellings, Priors Court; Engineer.

Falkirk. £97,500 development proposed, High St, by The Metropolitan Property Co. Ltd., 8 Gordon St, Glasgow.

Farnborough. Five-storey office block, Clock Hse junction, proposed by Cathay Investments Ltd.

Flint C.C. Tender: annual supplies including batteries and electrical spares for vehicles and plant; Surveyor, Llwynegrin, Mold.

Friern Barnet. Booth and Driver Ltd., Oakleigh Rd, N.20, propose new premises, Whetstone Close.

Gateshead. Newcastle Regional Hospital Board, Benfield Rd, Newcastle, propose children's unit, Sheriff Hill Hospital. Architects, Fennell and Baddiley, Bridge End Chmbrs, Chester-le-Street.

Glasgow. Proposed by Western Region Hospital Board, maternity department and neuro-surgical unit at Hardgate Rd, S.W.1. W. Underwood and Ptnrs., 2 La Belle Pl, C.3, architects for £450,000 hotel proposed at Jamaica and Clyde streets for Gt. Universal Stores Ltd. J. P. Coia, 12 Renfield St, C.2, architect for proposed nine-storey hotel, Bath St/West Nile St, for Marten Development Co. Ltd.

Grangemouth. S. Scotland E.B. propose £165,000 substation, Reddoch Rd.

Hackney. B.C. propose four-storey flatted factory, Southgate Rd and Balmes Rd; cost: £140,000.

Halifax. Planned by Leeds Regional Hospital Board, Harrogate, resiting of X-ray dept., Halifax Infirmary, to cost £70,628.

Hebburn. Wm Leech Ltd., St. James' St, Newcastle, propose development of Blue House Fm housing estate.

Keighley. Proposed by B.C.: extensions to the abattoir; cost: £104,300; contractors: Derek A. Smith Ltd., Dormers Shaw La Gdns, Guiseley.

Lanark. C.C. propose three police stations and eight dwellings, several sites. Contract includes electrical work; County Architect, 34 Albert St, Motherwell.

Leatherhead. Four-storey stores and offices, Ashtree Wks, Kingston Rd, proposed by Ashe Laboratories Ltd., of that address. British Food Mnfg. Industries Ltd., Randalls Rd, plan extensions to laboratories.

Leeds. Proposed by Leeds Regional Hospital Board, Harrogate, modernising wards, Menston Hospital, nr. Leeds, at cost of £114,145.

Lincoln. P. A. Moore, Fourways, The Square, Kinoulton, consulting engineer for electrical and mechanical services, Harmston Hall Colony, for Sheffield Regional Hospital Board.

London. Proposed: factory, Bollo La, Stirling Rd, for West London Iron and Wire Works Ltd., 61 Osborne Rd, W.3. Factory, Stirling Rd-Bollo La, for Lincoln Hair Products Ltd., 14a New Broadway, W.5. Planned: single-storey factory, Western Trdg Estate, Park Royal Rd, for Central Way Properties Ltd. New factory, Roslin Rd and Stirling Rd, for F. J. Blissett and Co. Ltd., Palmerston Rd, W.3. L.C.C. propose contract with Allen Fairhead and Sons Ltd., Sydney Rd, Enfield, for £172,515 old people's home, Ladywell Lodge, Lewisham, S.E. Proposed: shops, showrooms, workrooms and flats, Gt. Titchfield St, Langham St, W.1, by Devereux and Davies, architects, 3 Gower St, W.C.1. Proposed: redevelopment of site bounded by Upper Thames St, Gt. Trinity La, Garlick Hill, E.C.4, for Hudson's Bay Co.; surveyors: Richard Ellis and Son, 165 Fenchurch St, E.C.3. Redevelopment of Adelphi Theatre site, Strand, W.C.2, proposed by City Centre Properties Ltd., at cost of £1 million. Proposed by Geo. Wimpey and Co. Ltd., Hammersmith Gro, W.6, redevelopment of site at St. John's Wood Rd, Lodge Rd and Fairlop Pl, N.W.

Manchester C.C. Tender: Shacklife Green Secondary School, Moston; City Architect.

Mansfield B.C. Tender: 29 traditional bungalows and meeting room; Borough Engineer.

Middlesbrough. B.C. award contract for 75 dwellings, Berwick Hills and Pallister Pk, to Emco Ltd., King's Rd. B.C. propose new housing estate, of 582 dwellings, Ormesby Rd and Barge Fleet La; Borough Engineer.

Midlothian. C.C propose electronics factory to cover 10,000 sq ft, Newbattle, to be leased to Norbury Instruments Co. Ltd., Surrey.

Newark. W. Saunders and Ptnrs., 24 Castle Gate, architects for replacement of lift, Newark Hospital, for Sheffield Regional Hospital Board.

Newcastle. C.C. propose 64 maisonnettes, Scotswood redevelopment area; City Architect. John T. Bell and Sons, Market St Chmbrs, propose multi-storey luxury flat of 6½ acres, Adderstone Cres and Jesmond Dene Rd. C.C. propose 700 houses, Kenton, and two new schools in same area; architect: E. Lyons, Mill Hse, Bridge Rd, Hampton Court.

Newtownabbey. New technical college, Whiteabbey, proposed; cost: £350,000; County Architect, Antrim.

N. Ireland. Proposed: factory near Warrenpoint Rd, Newry, Co. Down, for Northern Waterproof Co. Ltd., The Manse, Daisy Hill, Newry.

Nottingham. A workshop block to cost £80,000 proposed by M.E.B. Y.M.C.A., Shakespeare St, plan £52,000 centre, Green La, Clifton estate; architect: J. Sketchley, 23 Kirk La, Ruddington.

Nuneaton. B.C. propose £270,000 swimming pool next year; Surveyor.

Orpington. Corob Holdings Ltd., 7 Hill St, W.1, plan large departmental store and swimming pool, High St. B.C. propose Civic Centre; architects: Sir John Burnet, Tait and Ptnrs., 10 Bedford Sq, W.C.1.

Peterborough. C.C. propose 60 dwellings, Paston Ridings; City Engineer.

Reading. M.o.W. Architects' Dept., Abell Hse, John Islip St, S.W.1, propose extensions to Royal Ordnance Factory, Birfield, Berks.

St. Neots. U.D.C. propose second phase of housing developments, Sandfields and Abrahams.

Salford C.C. Tender: Oaklands School and Salford Technical High School; City Architect. Manchester Regional Hospital Board, Cheetwood Rd, Manchester 8, plan extra geriatric ward, Ladywell Hospital; cost: £60,000. C.C. propose £87,000 scheme for Seedley junior training centre and hostel for handicapped young people. C.C. Tender: 120 flats, Bury New Rd, and alterations and extensions to Seedley County Primary School, Liverpool St; City Engineer.

Salisbury. Proposed by Caledonia Property Investments Co. Ltd., 2 St. Mary Axe, E.C.3, a bowling centre, restaurant, Castle St.

Southend. Proposed: factory, Prince Ave, for C. F. Marshall and Son Ltd., Arterial Rd, Eastwood.

South Kesteven. R.D.C. propose 32 dwellings in 1962; Surveyor, North St, Bourne.

Spalding. The Sheffield Regional Hospital Board propose new chronic sick unit, Johnson Hospital; quantity surveyor: Kerr Sherwin, 38 Bedford Pl, W.C.1.

Stockton. B.C. propose further 57 dwellings, Victoria; contractors: Moore and Cartwright, High St, Norton-on-Tees.

Sunderland. Munce and Kennedy, Seymour St, W.1, architects for proposed £200,000 bowling centre, Dykelands Rd. B.C. propose three more hostels for old people. Borough Architect.

Torquay. Site of Union Hotel, Union St, to be developed for shop and offices for the International Tea Co.'s Stores Ltd., Mitre Sq, E.C.3.

Tynemouth. Planned: offices, storage and chart bureau, Clive St, N. Shields, for J. Lillie and Gillie Ltd.; architects: G. H. Gray and Ptnrs., 50 Camden St, N. Shields.

Walsall. Proposed by B.T.C., Marylebone Rd, N.W.1, establishment of district electric depot, Mill La, Ryecroft.

Wellington. U.D.C. propose 49 dwellings, Bulford Field, Parklands Rd; Surveyor.

Wembley. Factory extensions proposed for Clearex Products Ltd., Heather Pk Dr; architect: S. Abel, Three Oaks, Arkley La, Barnet.

West Sussex. C.C. propose old people's home, Billingshurst, to provide 52 beds; cost: £89,100; County Architect, Chichester.

NEW COMPANIES

Extracted from the Register issued by Jordan and Sons Ltd., 116 Chancery La, W.C.2.

Bakker Lock Consultants Ltd., 45 Butts Green Rd, Hornchurch. Electrical engineers, etc. Nom. cap.: £100. Dirs.: Albert N. Bakker, Peter J. Lock, Patricia A. Bakker and Maureen P. Lock.

Basil N. Buckland Ltd., 56 Dawes Rd, S.W.6. Retailers and dealers in and manufacturers and repairers of electric light fittings, etc. Nom. cap.: £100. Dirs.: Doris L. Clifton, Basil N. Buckland and George S. R. Buckland.

Chelmer Electrical Trading Co. Ltd. Nom. cap.: £100. Dirs.: William C. Bocking and Miss Valerie A. Bocking, "Lynval," St. Peters in the Fields, Bocking, Braintree, Essex; Ronald G. Partner and Brenda M. Partner.

CJB (India) Ltd., CJB Hse, Eastbourne Terr, Paddington, W.2. To carry on in India, the U.K. or elsewhere the business of consulting, chemical, civil, nuclear engineers, etc. Nom. cap.: £100. Dirs.: John R. Smith and Anthony McLaren.

Colton. E.C. Connectors Ltd., 25 Moor La, Cranham, Upminster, Essex. Industrial electrical equipment manufacturers and factors, etc. Nom. cap.: £3,000. Dirs.: Arthur J. Colton and Stanley R. Hugkulstone.

Subsidiary of Colton Electrical Equipment Co. Ltd. formed to continue to market and manufacture under licence the E.C. type connectors.

A and E Gardiner Ltd., 5 Maxwell Rd, S.W.6. Electrical contractors, wireless engineers, etc. Nom. cap.: £200. Dirs.: Henry A. C. Gardiner and Mrs Elizabeth E. Gardiner.

A. and K. Hambury Ltd., 119 Church Rd, E.12. Radio, television and electrical engineers, etc. Nom. cap.: £100. Dirs.: Alfred Hambury and Kathleen Hambury.

S. Hammond Electrical Contractors Ltd., 316 York Rd, Wandsworth, S.W.18. To take over the business of electrical contractors carried on as "S. Hammond and Co.," at Wandsworth, S.W.18, etc. Nom. cap.: £1,000. Permanent dirs.: Robert B. Green and John A. Fahy.

J. and H. Electrics (South London) Ltd. Nom. cap.: £100. Permanent dir.: Jas. E. Barden, 17 Howden St, S.E.15. Sub.: Sylvia P. Barden.

Norman R. Lilly Ltd., 116 Carrfield Ave, Toton, Notts. To carry on business of electrical engineers, etc. Nom. cap.: £2,000. Dirs.: Norman R. Lilly and Brian G. Wain.

E. F. Mitchell (Canvey) Ltd., 10 Denham Rd, Canvey Island. To take over the business of an electrical contractor carried on at Canvey Island by E. F. Mitchell, etc. Nom. cap.: £100. Dirs.: Ernest F. Mitchell and Lily I. Mitchell.

Pindys Electric Ltd., 8a Russell Parade, Golders Green Rd, N.W.11. Electrical engineers and contractors, etc. Nom. cap.: £100. Dirs.: David Pindus and Mrs F. Pindus.

Prince and Watson Ltd., 2 Railway Approach, Wallington, Surrey. Electrical installation contractors, electrical engineers, etc. Nom. cap.: £1,000. Dirs.: Bernard H. E. Prince and William G. Watson.

Rediservice Ltd., 44 Broadway Market, Hackney, E.8. Manufacturers of and dealers in radio, electrical and mechanical apparatus, etc. Nom. cap.: £100. Dirs.: Sidney Burns, Anthony Rabicano, Betty H. Burns and Edna R. Rabicano.

Rolls-Colston Appliances Ltd., Alderman's Hse, Bishopsgate, E.C.2. Manufacturers of and dealers in dishwashers, etc. Nom. cap.: £250,000. Dirs.: Sir Charles B. Colston, Richard Reader Harris, Michael Colston, Aaron Wright, John Bloom and Henry Oppenheim.

This is the company formed to market the Colston dishwasher as reported 16 Nov., page 743.

Louis J. Schaverien (Appliances) Ltd., 38 Gt. Portland St, W.1. Manufacturers of and dealers in electrical gooods, etc. Nom. cap.: £1,000. Dirs.: Louis J. Schaverien and Mrs G. H. Schaverien.

Southern Battery Co. (I.O.W.) Ltd., 5 Birmingham Rd, Cowes, I.W. Nom. cap.: £100. Dirs.: Donald E. Beswick and Mrs Margaret L. Beswick.

Steyning Electrical Centre Ltd., 34 High St, Steyning, Sussex. Nom. cap.: £100. Dirs.: Ronald K. Bryant and Mary A. L. E. Bryant.

Surrey Electrical Installations (Contracting) Ltd., 27 Station Way, Cheam, Surrey. Nom. cap.: £1,000. Dirs.: John L. Tuckfield, Leonard R. Hardy, Gordon P. Miles and Reginald L. White.

David Webster Ltd., Four Poplars, Jones Rd, Goffs Oak, Cheshunt, Herts. Contractors for the erection of street lighting columns, etc. Nom. cap.: £1,000. Dirs.: David C. Webster and Monica M. Webster.

Westwood Meter Re-conditioning Co. Ltd., 2 Vaughan Parade, Torquay, Devon. Nom. cap.: £100. Dirs.: Mrs Ethel C. Woodard, Derek I. Woodard and Mrs G. M. Woodard.

Peter White (Electrical) Ltd., 27b Broomfield Rd, Chelmsford, Essex. Electrical engineers, etc. Nom. cap.: £500. Dirs.: Peter E. White, Marlene P. White and John F. Malone.

MEETINGS TO NOTE

THURSDAY, 7 DEC.

I.E.E. Parsons Memorial Lecture: "Magnetohydrodynamics," Prof M. W. Thring. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Midlands). Discussion: "Semiconductors for Light Current Engineering." E.M.E.B. Showrooms, 191 High St, Lincoln. 7.30 p.m.

I.E.E. (N. Midlands). "Electricity in the Chemical Industry." P. McDermot Lecture Theatre, Y.E.B. Offices, Ferensway, Hull. 6.30 p.m.

I.E.E. (Maidstone). "Electronics in the Postal Mail Services," G. P. Copping. "Wig and Gown," Maidstone. 7 p.m.

I.E.E. (Bristol Graduates and Students). "Transistors *v.* Valves," A. W. Hart. Cheltenham Technical College. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Steam Plant Group). Discussion: "Small Industrial Steam Plant." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

INSTITUTION OF PLANT ENGINEERS (Birmingham). "Electronic Control in Industry with Particular Reference to Automation." Hotel Leofric, Coventry. 7.30 p.m.

I.E.S. (Cardiff). "Visual Problems of Motorways," J. M. Waldram. Bowchier Hall, Cardiff.

I.E.S. (Manchester Centre). "Fundamental Principles of Street Lighting," C. S. Bayliffe. Demonstration Theatre, N.W.E.B., Town Hall Extension, Manchester 2. 6 p.m.

I.E.S. (Nottingham Centre). "The New I.E.S. Code," A. Roberts. Electricity Centre, Carrington St. 6 p.m.

A.S.E.E. (S.W. London). "Floor-warming," J. E. Cook: "Electrical Contractors," E. C. Story. Prince of Wales Hotel, S.W.19. 8 p.m.

A.S.E.E. (Brighton, Hove and District). "Engineering in a Sugar Refinery," J. A. Pearson. The Cricketers' Hotel, Black Lion St, Brighton 1. 7.30 p.m.

FRIDAY, 8 DEC.

I.E.E. (Medical Electronics Discussion Group). Discussion: "The Peltier, Hall and Seebeck Effects." Savoy Pl, W.C.2. 6 p.m.

I.E.E. (Western). "Some Unusual Types of Electrical Machinery," Prof G. H. Rawcliffe. Gloucester Technical College. 7.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Electron Microscopy Group). "Electron Microscopy in Japan," T. Mulvey and Dr M. Whelan. 47 Belgrave Sq. S.W.1. 2.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Applied Spectroscopy Group). Recent Development on X-ray Fluorescence Spectroscopy. Dr J. L. de Vries at the Royal Aeronautical Society. 2.30 p.m

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Non-destructive Testing Group). "The Correlation of Elastic Constants in Single Crystals and Polycrystals," Dr M. F. Markham. 47 Belgrave Sq. S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Midlands). "Instruments in Clinical Chemistry," N. Crawford, and "Electronics in Surgery," R. Lightwood. Lecture Theatre, Byng Kendrick Suite, Gosta Green College of Technology, Aston St, Birmingham. 7 p.m.

A.S.E.E. (S. Wales). Branch annual dinner at the Grand Hotel, Cardiff.

A.S.E.E. (Stoke and Crewe). "Estimating in Relation to Electrical Installation Contracts," W. H. Brooks. Royal Hotel, Crewe. 7.30 p.m.

MONDAY, 11 DEC.

I.E.E. (N.E.). "Progress in Oil-filled Cables and Their Accessories," A. N. Arman, F. J. Miranda and G. B. Bishop, and "The Influence of Ageing on the Characteristics of Oil-filled Cable Dielectric," P. Gazzana-Priaroggia, G. L. Palandrf and U. Pelagatti. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6.15 p.m.

I.E.E. (London Graduates and Students). "Design of Service Equipment," B. W. Norman. Unit Cinema, 3 (Tels) Training Batt., R.E.M.E., Arborfield, Berks. 7 p.m.

I.E.E. (London Graduates and Students). Address by the President: "The Professional Engineer and an Expanding Industry," G. S. C. Lucas. Savoy Pl, W.C.2. 6.45 p.m.

I.E.E. (E. Anglian). "Co-operative Education in Engineering in the U.S.A.," R. L. Cannel. College of Arts and Technology, Cambridge. 6.30 p.m.

I.E.E. (N. Staffs). "Technical and Economic Aspects of the Supply of Reactive Power in England and Wales," W. Casson and H. J. Sheppard. English Electric Co. Ltd., Stafford. 7 p.m.

I.E.E. (Western). "Third Hunter Memorial Lecture: "The Application of Electronics in the Electricity Supply Industry," J. S. Forrest. South Wales Institute of Engineers, Cardiff. 6 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY. "Static Electricity," Dr P. S. H. Henry. 47 Belgrave Sq, S.W.1. 2.30 p.m.

I.E.S. (Leeds Centre). "The Problems of Lighting Urban Motorways," G. K. Lambert. City Art Gallery, The Headrow, Leeds. 2.30 p.m.

I.E.S. (Leicester Centre). Joint meeting with Leicester Electrical Society, "Lighting for Inspection," H. E. Bellchambers and S. M. Phillipson. Demonstration Theatre, East Midlands E.B., Charles St, Leicester. 6.15 p.m.

I.E.S. (Sheffield Centre). "Impressions of the U.S.A.," A. Roberts. University, Western Bank, Sheffield. 6.30 p.m.

A.S.E.E. (Bournemouth and District). "Commercial Refrigeration." South Western Hotel, Holdenhurst Rd, Bournemouth. 8 p.m.

A.S.E.E. (Central London). "Stage Lighting, 1961." 29 King St, W.C.2. 7.15 p.m.

BIRMINGHAM ELECTRIC CLUB. "Colour Television," B. V. Somes-Charlton. Grand Hotel. 5.30 p.m.

TUESDAY, 12 DEC.

I.E.E. (Electronics and Communications). "Diversity Reception and Automatic Phase Reception," L. Lewin. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (E. Midlands Electronics and Control Group). "Altitude Control of Earth Satellites." B. Stewart. Lecture Theatre, E.M.E.B. Showrooms, Charles St, Leicester. 6.30 p.m.

I.E.E. (N.W.). "Americanism and Anti-Americanism," Prof Marcus S. Cunliffe. Seventeenth annual lecture in co-operation with the Manchester University.

I.E.E. (N. Ireland). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Lecture Theatre L.G.25, David Keir Bldg, Queen's University, Stranmill's Rd, Belfast 9. 6.30 p.m.

I.E.E. (S.E. Scotland). "Analysis of Overall Stability of Multi-Machine Power Systems," J. G. M'les. Carlton Hotel, North Bridge, Edinburgh. 7 p.m.

I.E.E. (Southern Electronics and Control Group). Discussion: "High Speed Measuring Techniques in the Nano Second Region." University, Southampton. 6.30 p.m.

I.E.E. (Cambridge Electronics and Measurement Group). "The Banana-Tube Display System—A New Approach to the Display of Colour Television Pictures," P. Schagen. Cavendish Laboratory, Free School La, Cambridge. 8 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Electronics Group). "Integrated Electronics." Dr J. W. Granville. 47 Belgrave Sq, S.W.1. 5.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Stress Analysis Group). "Strain Gauges," 47 Belgrave Sq, S.W.1. 2.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Midland). "The Observation of Radio Stars."

Dr P. F. Scott. Midland Institute, Birmingham. 6.30 p.m.

INSTITUTE OF PLASTICS (Scottish). "The Use of Ploymers for Paper Coating," J. R. Young. Kenilworth Hotel, Glasgow. 7.30 p.m.

INSTITUTION OF CIVIL ENGINEERS. "Maintenance of Hydro-Electric Schemes and the Development of Sidestream Intakes," H. D. Morgan and D. D. Reid-Thomas. Great George St, Westminster, S.W.1. 5.30 p.m.

INSTITUTION OF HEATING AND VENTILATING ENGINEERS (Graduates). "Fans—Types and Uses," J. W. Stammers. Engineering Centre, Stephenson Pl, Birmingham. 6.30 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Automobile Division). "Instrumentation Problems of Internal Combustion Engine Development," J. G. G. Hempson. 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

I.E.S. Discussion: "Applying the Code." Federation of British Industries, Tothill St, S.W.1. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Chester). "Design, Application and Selection of Automatic Control Valves," P. Stone. Stanley Palace, Watergate St, 7 p.m.

A.S.E.E. "Towards Better Office Lighting," A. Wilcock. I.E.E., Savoy Pl, W.C.2. 6.15 p.m.

A.S.E.E. (Aldershot and Districts). Ladies' Night with the E.A.W. Queen's Hotel, Farnborough, Hants.

A.S.E.E. (Bristol and West). "Telephone Repeaters," K. F. Broome and A. J. White; and "Railway Electrification," D. T. Davidson. Grand Hotel, Bristol. 8 p.m.

A.S.E.E. (Chester). "Static Switching Control Systems," B. A. W. Midgley. The Blossoms Hotel. 7.45 p.m.

A.S.E.E. (Glasgow). "Colour Television." Kenilworth Hotel, 5 Queen St. 8 p.m.

A.S.E.E. (Gloucester and District). "Control Centres for Modern Industry," Royal Hotel, Station Rd, Gloucester. 8 p.m.

A.S.E.E. (Oxford and Districts). "Public Electric Supply Distribution," J. L. Taylor. Board Room, Employment Exchange, St. Aldates. 7.30 p.m.

A.S.E.E. (York). "Oil As Fuel." Royal Station Hotel. 7.30 p.m.

WEDNESDAY, 13 DEC.

I.E.E. (Supply). "Electrical Aspects of Hunterston Nuclear Generating Station," J. Henderson, G. F. Kennedy and K. J. Wootton. In conjunction with British Nuclear Energy Conference. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N.E.). "The Protection of High-Voltage Insulators from Power Arc-Damage," A. E. Guile. Carlisle Technical College. 7 p.m.

I.E.E. (N. Lancs). "Turbo-Generator Performance Under Exceptional Operating Conditions," T. H. Mason, P. D. Aylett and F. H. Birch. N.W.E.B. Lecture Theatre, Jubilee St, Blackburn. 7.30 p.m.

I.E.E. (Rugby). "Electric Traction," J. A. Broughall. Rugby College of Engineering Technology. 6.30 p.m.

I.E.E. (Sheffield). "Millimetre Waves," J. Allison. Sheffield University. 6.30 p.m.

I.E.E. (S.W. Scotland). "Analysis of Overall Stability of Multi-Machine Power Systems," J. G. Miles. Institution of Engineers and Shipbuilders, 39 Elmbank Cres, Glasgow C.2. 6 p.m.

I.E.E. (Southern Electronics and Control Group). Discussion: "Silicon-controlled Rectifiers." C.E.G.B. Offices, High St, Portsmouth. 6.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Liverpool and N. Wales). "Physics and Architecture," Prof J. K. Page. The University, Liverpool. 7 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Low Temperature Group). "Ferromagnetism and Antiferromagnetism." 47 Belgrave Sq, S.W.1. 11 a.m.

INSTITUTION OF PLANT ENGINEERS (Western). "Safety in Factories," J. B. Taylor. Grand Hotel, Broad St, Bristol. 7.15 p.m.

NEWPORT AND DISTRICT ELECTRIC CLUB. "A Communications System for an Integrated Iron and Steel Works," R. Meredith. King's Head Hotel, Newport, Mon. 6.30 p.m.

R.S.A. "Tin: Its Contribution to Social Development," E. S. Hedges. John Adam St, Adelphi, W.C.2. 6 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Control Section). "Application of Complex Plane Methods to System Design," P. K. M'Pherson. Manson Hse, 26 Portland Pl, W.1. 6.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Manchester). "Instrumentation for Oil Fired Glass Furnaces," N. I. Walker. Literary and Philosophical Society, 36 George St. 6.45 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Newcastle). Discussion night. Conference Room, Roadway Hse, Oxford St. 7 p.m.

I.E.S. (Swansea Group). "Luminous Ceilings and Modular Fittings," R. L. C. Tate. Demonstration Theatre, South Wales EB, The Kingsway. 6 p.m.

A.S.E.E. (Bristol and West). "Industrial Cabling." Turk's Head Hotel, Exeter. 8 p.m.

A.S.E.E. (East Anglia). "Electric Floor-warming and Ancillary Equipment," E. A. Moneypenny. Red Lion Hotel, Thetford. 7.30 p.m.

A.S.E.E. (Wolverhampton and District). "Electrically Operated Fire Detecting and Alarm Systems," A. Whitehouse. Chamber of Commerce, District Bank Chmbrs, Lichfield St. 7.45 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Television Group). Discussion: "Colour Television." London School of Hygiene and Tropical Medicine, Keppel St, W.C.1. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Merseyside). "Nuclear Power Station Instrumentation," M. W. Jervis. Walker Art Gallery, Liverpool. 7.30 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (N.E.). "Masers and Parametric Amplifiers," T. H. Wilmshurst. Neville Hall, Westgate Rd, Newcastle upon Tyne. 6 p.m.

BRITISH INSTITUTION OF RADIO ENGINEERS (Scottish). "Jodrell Bank," J. B. Wilson. The University, Drummond St, Edinburgh. 7 p.m.

THURSDAY, 14 DEC.

I.E.E. (Utilisation). "Oscillating Machines—Synchronous and Asynchronous," E. R. Laithwaite. "An Oscillating Synchronous Linear Machine," E. R. Laithwaite and R. S. Mamak. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (N. Scotland). Second Hunter Memorial Lecture: "The Protection of Electrical Systems," H. G. Bell. Electrical Engineering Department, Queen's College, Dundee. 7 p.m.

I.E.E. (S.W. Sub-centre). "The Organisation of Industrial Electrical Maintenance," S. R. Phelps. Plymouth "B" Generating Station, Prince Rock, Plymouth. 3 p.m.

I.E.E. (Southern) Dinner and dance. Polygon Hotel, Southampton.

I.E.E. (W. Wales). Informal paper: Prof W. Fishwick. Electricity Board Showrooms, The Kingsway, Swansea. 6 p.m.

I.E.E. (Western Utilisation Group). "The Organisation of Industrial Electrical Maintenance," S. R. Phelps. (Joint meeting with South Western Sub-centre). Prince Rock Generating Station, Plymouth. 3 p.m.

I.E.E. (Irish). "Production of Electric Motors in Ireland," L. O'Sullivan. Physical Laboratory, Trinity College, Dublin. 6 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Optical Group). "A Zoom Stereoscopic Microscope," T. A. Minns. Imperial College, London. 2.30 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Acoustics Group). "The Acoustics of the Organ," Imperial College, London. 5.30 p.m.

INSTITUTE OF MECHANICAL ENGINEERS (Nuclear Energy Group, Western Branch Area). "Maintenance Experience of the Calder Hall Reactor," J. R. Treharne. University Engineering Laboratory, Bristol. 6 p.m.

INSTITUTION OF PLANT ENGINEERS (Merseyside and N. Wales). "Overhead Equipment for Railway Electrification," J. H. Leonard. Exchange Hotel, Liverpool. 7.15 p.m.

IRON AND STEEL INSTITUTE. "Operating Experience With an 80-ton Electric Arc Melting Furnace," J. M. Mowat, A. G. McMillan and R. McDonald. Institute of Engineers and Shipbuilders in Scotland, 39 Elmbank Cres, Glasgow C.2. 6.45 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Bristol). "The Atomic Clock," Dr L. Essen. Department of Physics, University of Bristol, The Royal Fort. 7.30 p.m.

SOCIETY OF INSTRUMENT TECHNOLOGY (Liverpool). "The Versatility of the Electronic Potentiometer," F. W. J. Howard. M.A.N.W.E.B. Industrial Centre, Paradise St. 7 p.m.

S. WALES INSTITUTE OF ENGINEERS. "Modern Process Control," O. G. Pamely-Evans. Institute Bldgs, Park Pl, Cardiff. 6 p.m.

RADAR AND ELECTRONICS ASSOCIATION. "Loudspeaker Enclosures," J. Gough and Professor F. Landgrebe. Lecture Hall, R.S.A., John Adam St, Adelphi, W.C.2. 7 p.m.

A.S.E.E. (Southampton). "New Techniques in Stereosound," F. H. Brittain. Polygon Hotel. 8 p.m.

A.S.E.E. (Bradford and District). "Horology," W. Barton. Midland Hotel, Bradford. 7.30 p.m.

CHELMSFORD ENGINEERING SOCIETY. "Radar Observation of Birds," Dr E. Eastwood. Hoffmann's Social Hall. 7.30 p.m.

FRIDAY, 15 DEC.

I.E.E. (E. Midlands). "Some Notes on the Electrical Requirements of General Cargo Docks," E. R. Radway. Technical College, Leicester. 7.15 p.m.

I.E.E. (N. Scotland). Second Hunter Memorial Lecture: "The Protection of Electrical Systems," H. G. Bell. Robert Gordon's Technical College, Aberdeen. 7.30 p.m.

I.E.E. (Southern). "Cable Fault Localisation," J. H. Classey. S.E.B. Showrooms, Newport, I.W. 6.30 p.m.

E.P.E.A. (Meter Engineers' Technical Group). "Your Silent Servant, the Time Switch," J. Key. Caxton Hall, S.W.1. 6.30 p.m.

A.S.E.E. (Coventry and District). "A Simple Approach to Computers," M. M. Robins. Conservative Rooms, 16 Queen's Rd, Coventry. 8 p.m.

SATURDAY, 16 DEC.

A.S.E.E. Gala Ladies' Night. Connaught Rooms, Great Queen St, W.C.2.

A.S.E.E. (Leeds). Annual dinner and dance at the Parkway Hotel.

MONDAY, 18 DEC.

I.E.E. (Electronics and Communications). Lecture: "Large Microwave Steerable Aerials for Communication with Artificial Earth Satellites and Space Probes," F. J. D. Taylor. Savoy Pl, W.C.2. 5.30 p.m.

I.E.E. (Mersey and N. Wales). "Education of an Electrical Engineer," M. R. Gavin: and "The Place of Formal Study in the Post-Graduate Training of an Electrical Engineer," N. N. Hancock and P. L. Taylor. Royal Institution, Liverpool. 6.30 p.m.

I.E.E. (N.E. Measurement and Electronics Group). "Heaviside—His Life and Work," Professor R. L. Russell. College of Technology, Northumberland Rd, Newcastle. 6.15 p.m.

I.E.E. (Sheffield). Discussion: "Apprentice Training." Angel Hotel, Brigg. 7 p.m.

INSTITUTE OF PHYSICS AND PHYSICAL SOCIETY (Manchester). "A Musician Looks at Physics," F. R. Cox. The University, Manchester. 7 p.m.

INSTITUTION OF MECHANICAL ENGINEERS (Education and Training Group). Discussion: "The Teaching of Machine Tool Technology as an Academic Subject." 1 Birdcage Walk, Westminster, S.W.1. 6 p.m.

TRADE MARKS

This information is extracted from the Official Journal by permission of the Controller.

Ashdee. B816,638. Class 7. Paint sprayers, etc. Atlee Corpn., 330 Bear Hill Rd, Waltham, Mass.

Beeline. B821,177. Class 7. Conveyors, elevators, etc. Bagshawe and Co. Ltd., Dunstable Wks, Church St, Dunstable.

Dirigent. B814,010. Class 10. Electrotechnical medical apparatus, etc. Standard Telephon und Telegraphen Aktiengesellschaft Czeija, Nissle Co., Dresdnerstrasse 73-77, Vienna 20, Austria.

Morfax. 780,465. Class 7. Metal working machines; etching, printing, painting machines, etc. Morfax Ltd., Willow La, Mitcham, Surrey.

Pressductor. 822,247. Class 9. Measuring devices, tensiometers, thrust gauges, etc. Allmänna Svenska Elektriska Aktiebolaget, Västeras, Sweden.

Pye in design. 821,853. B823,468. Class 9 and B823,469. Class 11. Electro-dynamic vibrators for testing power amplifiers, domestic appliances, etc. Pye Ltd., Radio Wks, St. Andrew's Rd, Cambridge.

Sciaky. B805,736. Class 7. Welding machines. Sciaky Electric Welding Machines Ltd., Falmouth Rd Trading Estate, Slough, Bucks.

Traffitrol. 825,378. Class 9. Apparatus for detecting and counting passing vehicles. Minneapolis-Honeywell Regulator Co., 2747 Fourth Ave South, Minneapolis, U.S.A.

Trans-stor-matic. 809,540. Class 7. Conveyors. Teleflex Products Ltd., 9 Cavendish Sq, W.1.

Trayveyor. 822,209. Class 7. Conveyors, lifts, elevators, etc. Lamson Eng. Co. Ltd., 6-8 Hythe Rd, Willesden, N.W.10.

Valiant. 823,986. Class 7. Sewing machines, etc. Brother International Corpn. (Europe) Ltd., Santry, Dublin.

Electrical Times, 7 December, 1961

ONE OF THE TWO RECTIFIER TRANSFORMERS erected at the Central Electricity Generating Board Terminal Station of the Cross-Channel D.C. Power Link at Lydd, Kent. These units are rated at 95/95/65 MVA 284/83·6/33kV and are believed to be the LARGEST RECTIFIER TRANSFORMERS IN THE WORLD.

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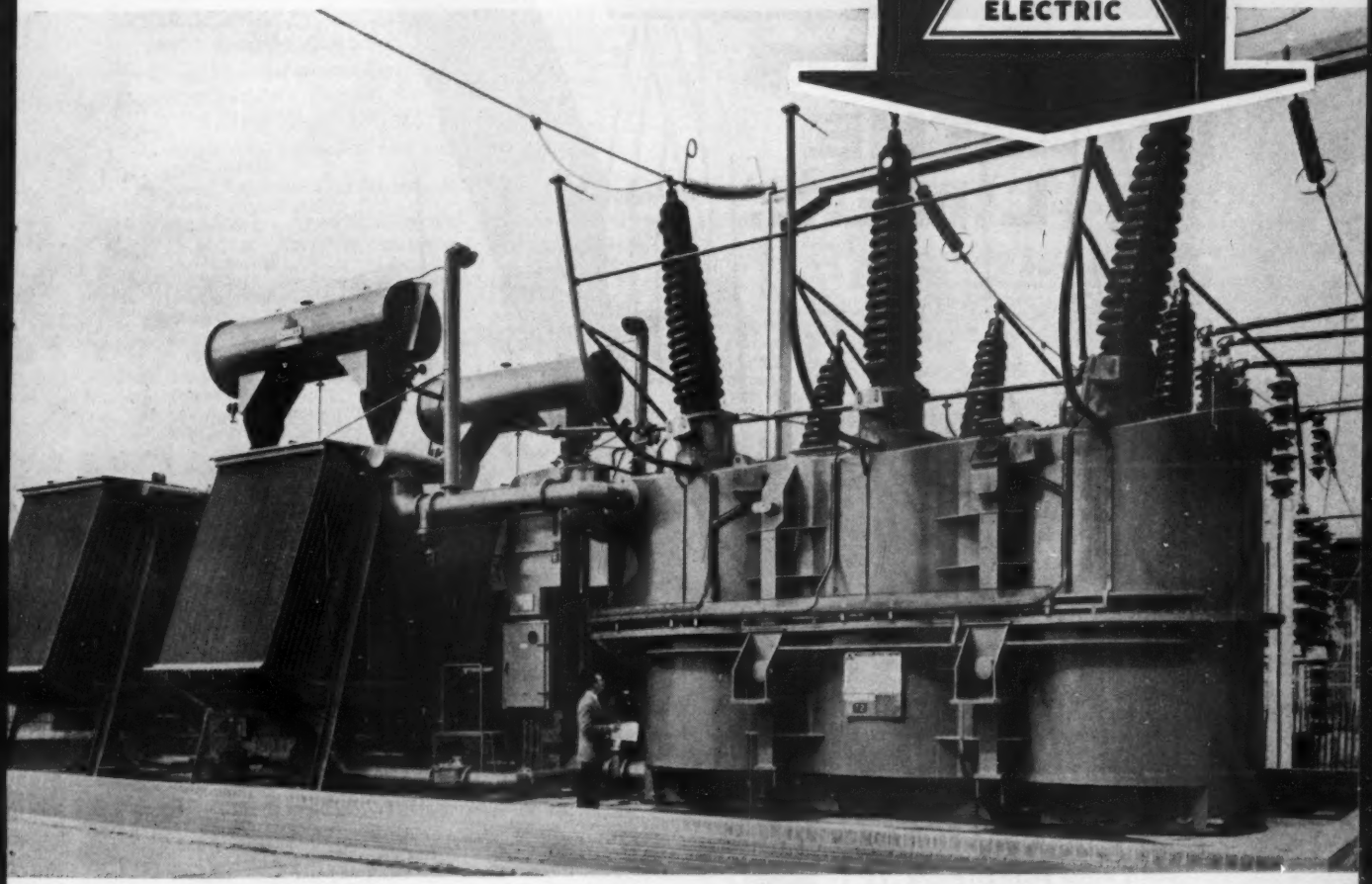

TRANSFORMERS

Modern plant and more than forty years' experience ensure that we are particularly well-equipped to manufacture transformers up to the largest sizes and the highest voltages. Manufacture is under our own control from the earliest possible stages. We build all our own tanks. Winding copper is paper wrapped in our special humidity controlled shops. Windings up to the largest sizes are treated in our 200-ton coil pre-shrinkage press. Other up-to-date equipment includes a 7,000 cu. ft. vacuum drying chamber and comprehensive plant for routine and impulse testing.

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HOLDS THE LINE....

H.M.T.S. Monarch which has laid the deep sea telephone cable to Canada as part of a projected Commonwealth round - the - world link-up. Photograph by courtesy of H.M. Postmaster-General.

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LINE GUARDS—*for conductor protection at insulators*
LINE SPLICES—*full tension joints*
PATCH RODS—*for repair of strands*
GUY GRIP *Dead Ends—the most economical way of making-off stays*
ARMOR GRIP SUSPENSION ASSEMBLY—*a revolutionary suspension clamp*
SPLICE SHUNTS—*for overheated joints*
BUNDLED CONDUCTOR SPACER UNITS—*the best twin conductor spacer*
*Patent Application Number 817535

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CLASSIFIED ADVERTISEMENTS

TENDERS INVITED

COUNTY BOROUGH OF BLACKPOOL

Lighting and Electrical Services Department

TENDERS invited for the supply of Street Lighting Equipment for the following schemes:

A. 60 Group "A" prestressed, spun concrete columns.
60 Group "A" fluorescent lanterns, including control gear.
60 Synchronous solar dial time-switches.
B. 120 Group "B" prestressed, spun concrete columns.
120 Group "B" fluorescent lanterns and brackets, including control gear.
120 Synchronous solar dial time-switches.
C. 100 Group "A" prestressed, spun concrete columns.
600 Group "B" prestressed, spun concrete columns.
60 Intermediate prestressed, spun concrete columns.
110 6 ft concrete extension pieces for Group "B" columns.
100 Group "A" fluorescent lanterns, in cluding control gear.
600 Group "B" fluorescent lanterns, including control gear.
170 Intermediate fluorescent lanterns, including control gear.
100 Group "B" post-top fluorescent lanterns, including control gear.
970 Synchronous solar dial time-switches.
D. 80 2 ft concrete extension pieces for Group "B" columns.
80 Group "B" fluorescent lanterns, including control gear.
80 Synchronous solar dial time-switches.

Specifications, Drawings, Tender and General Conditions from the Director of Lighting and Electrical Services, Rigby Rd East, Blackpool, to be returned by 2.30 p.m. on 8 Jan., 1962. (D 35)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

30 MVA Transformer for

Charleston Substation, Dundee

TENDERS are invited for the above Transformer, and Tender Documents may be obtained from the Board's Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3, on receipt of a deposit of £2 2s (returnable). The Board do not bind themselves to accept the lowest or any Tender. (D 32)

BOROUGH OF EALING

Renewal of Electrical Installations at Selborne Primary and Secondary School, Conway Crescent, Greenford, Middlesex.

TENDERS are invited from approved N.I.C.E.C. contractors for the above-mentioned work. Specification and Tenders from the Borough Engineer, Town Hall, Ealing, W.5, on receipt of deposit of £1, returnable on receipt of a bona fide tender.

Closing date: 27 Dec., 1961.

E. J. COPE BROWN,
Town Clerk.
(D 14)

NORTH OF SCOTLAND HYDRO-ELECTRIC BOARD

60 MVA Transformer for

Glenagnes Substation, Dundee

TENDERS are invited for the above Transformer, and Tender Documents may be obtained from the Board's Chief Electrical and Mechanical Engineer, 16 Rothesay Terr, Edinburgh 3, on receipt of a deposit of £2 2s (returnable). The Board do not bind themselves to accept the lowest or any Tender. (D 33)

ABERGELE URBAN DISTRICT COUNCIL

Class "A" Street Lighting

TENDERS are invited for the installation of 176 140 W Sodium Vapour and 13 250 W colour-corrected Mercury Vapour Lighting Points in Water St, Dundonald Ave, Abergele; Marine Rd and Towyn Rd, Pensarn; Towyn Rd, Towyn; and Foryd Rd, Kinmel Bay; all forming part of A.548.

Specification, Bills of Quantities and Form of Tender may be obtained from and Plans inspected at the Office of the Engineer and Surveyor, Town Hall, Pentre Mawr, Abergele.

Tenders on the form supplied are to be delivered to the undersigned in the envelope provided NOT LATER THAN 12 NOON, on TUESDAY, 19 DEC., 1961.

The Council does not bind itself to accept the lowest or any Tender.

EDWARD J. LLOYD,
Clerk of the Council.

Town Hall,
Pentre Mawr,
Abergele.
20 Nov., 1961. (D 15)

APPOINTMENTS VACANT

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

REGIONAL ELECTRICAL ENGINEER'S DEPARTMENT

THIRD ASSISTANT ENGINEER (CONSTRUCTION)

Vacancy No. S.E.57/61.

ENGINEER required to join a team based at Kingston concerned with specifying in detail equipment required for all types of transmission contracts, supervision of preparation of layout and civil works drawings, examination of tenders and conducting technical correspondence with contractors. This will entail visiting sites throughout the Division and the owner/driver of a car will be preferred. Candidates must be suitably qualified and have a thorough knowledge of contract procedure and conditions.

Salary: £1,215/£1,550 per annum, including London Allowance, N.J.B. Class I, Grade 8.

Applications stating age, details of education, present position, experience, etc., should be submitted to the Regional Secretary, Ergon Hse, Horseferry Rd, S.W.1, by not later than 16 Dec., 1961. (D 30)

CENTRAL ELECTRICITY GENERATING BOARD

Southern Division

South Western Region

THIRD ASSISTANT ENGINEERS

NON-DESTRUCTIVE TESTING SECTION

GENERATION SERVICES DEPARTMENT

SEC/3.175.

APPLICANTS should have experience in the application of Non-Destructive Testing methods and techniques, with an adequate knowledge of the physical principles involved and the properties of the materials to which they are applied.

Candidates should preferably possess qualifications leading to membership of an appropriate professional institution or equivalent qualifications.

The posts will be based at Portsmouth, but the work involves travelling to sites.

Salary: N.J.B. Grade K8, £1,275/£1,410.

Special application forms, obtainable only from the Personnel Officer, 111 High St, Portsmouth, should be returned by 19 Dec., 1961.

ASSISTANT ENGINEER (EFFICIENCY)

SOUTHAMPTON GENERATING STATION

SEC/3.171.

Applicants should have had appropriate experience in a generating station and should preferably possess qualifications leading to corporate membership of a recognised professional institution.

Salary: N.J.B. Scale 8, Grade F.7, £1,040/£1,165.

Special application forms, obtainable only from the Personnel Officer, 111 High St, Portsmouth, should be returned by 19 Dec., 1961. (D 61)

YORKSHIRE ELECTRICITY BOARD

No. 7 (Grimsby) Sub-Area

GENERAL ASSISTANT ENGINEER (DRAUGHTSMAN)

APPLICATIONS are invited for the post of Draughtsman (either Electrical or Building and Civil Engineering) in the Sub-Area Drawing Office.

The successful applicant will be required to assist in the Drawing Office on work which includes Building Drawings, Electrical Diagrams and Records.

Salary: N.J.B. Either Class K, Grade 16 (Scale 3) £715/£805 p.a.; or Class K, Grade 15 (Scale 4), £765/£870 p.a., according to qualifications.

Applications, together with the names of two referees, should be sent to the Manager, No. 7 (Grimsby) Sub-Area, Yorkshire Electricity Board, Moss Rd, Grimsby, not later than 22 Dec., 1961. (D 57)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

ASSISTANT CONSUMERS' ENGINEER

REQUIRED at Wrexham. Salary within range £765/£870 per annum (N.J.B H.13, Scale 4).

Applicants must have completed a recognised apprenticeship, and had engineering training. Technical qualifications desirable.

The duties of the post will include estimating and preparation of specifications for contracting work and the supervision of such work, advising consumers on matters relating to electricity supply and the utilisation of electricity and equipment.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham.

Closing date: 22 Dec., 1961. (D 69)

Advertisements should be sent to the Classified Advertisement Dept., Electrical Times, Sardinia House, Sardinia Street, London, W.C.2, before 10 a.m. on TUESDAY of the week of issue. Official Displayed Advertisements are charged at 46s. per inch, and all other classified advertisements at 3s. 6d. per line. Situations Wanted four insertions at twice the single insertion rate. Fee for Box Number and postage on replies 2s.

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

OPERATION SUPERINTENDENT

REQUIRED at Hams Hall "C" Power Station, N.J.B. service conditions, superannuable appointment, salary within Schedule A, Grade K.4, £1,650/£1,830.

Applicants should have received a sound technical and practical training, and should have considerable experience in the operation and maintenance problems arising in a large modern power station. The possession of a recognised technical qualification will be an advantage.

Apply, quoting Vacancy No. 291/61 MR on form AE6, available from the Station Superintendent, Hams Hall Power Station, Lea Marston, Sutton Coldfield, Warks, by 18 Dec., 1961. (D 42)

MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited for the following superannuable posts:

South Staffs and North Worcs Area

DEMONSTRATOR (FEMALE)

(SMETHWICK/WEST BROMWICH DISTRICT)

Applicants must have a good education and should have a certificate of a recognised domestic training college and/or the E.A.W. Certificate and have at least two years' training and experience. Duties include lecture demonstrations in Service Centres and on consumers' premises and advice to consumers on the selection and use of electrical apparatus. Salary: £600/£700 per annum (N.J.C. Grade 1).

Apply, by letter, within 14 days, stating age, education, qualifications, training and experience, to District Manager, Midlands Electricity Board, 296-8 High St, West Bromwich, Staffs.

Birmingham Area

FOURTH ASSISTANT ENGINEER

(TEMPORARY CLERK OF WORKS)

(AREA ENGINEER'S DEPARTMENT)

The applicants must have extensive experience in civil engineering and building works associated with multi-storey buildings. The successful applicant will be employed at Summer La, Birmingham, for the duration of a contract covering the construction of a new office block for the Birmingham Area of the Midlands Electricity Board, which is to commence early in 1962. The salary will be within the range £1,115/£1,245 per annum (N.J.B. Class N, Grade 13).

Apply, by letter, within 14 days, stating age, full details of experience, present position and salary to Emil Braathen, Area Manager, Midlands Electricity Board, 14 Dale End, Birmingham 4.

Worcestershire Area

THIRD ASSISTANT DISTRICT ENGINEER

(REDDITCH/BROMSGROVE DISTRICT)

Applicants should have had experience in the construction and maintenance of H.V. and L.V. overhead lines, and some knowledge of wayleave negotiation and records and substation acquisition would be an advantage. Technical qualifications desirable. Salary: £965/£1,090 per annum (N.J.B. Class G, Grade 9).

Apply, by letter, within ten days, stating age, experience, present position and salary to District Manager, Midlands Electricity Board, Windsor Rd, Redditch, Worcs.

DEMONSTRATORS

(BANBURY, EVESHAM AND REDDITCH DISTRICTS)

Applicants must have had a good education and should have a certificate of a recognised domestic training college and/or

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the E.A.W. Certificate and at least two years' training and experience. Applicants must be prepared to take an active part in the sales organisation, and selling experience would be an advantage. Duties include lecture demonstrations in service centres and on consumers' premises and advice to consumers on selection and use of electrical apparatus. Salary: £600/£700 per annum (N.J.C. Grade 1).

Apply, by letter, within 14 days, stating District preferred, age, education, qualifications, training and experience, to Area Manager (Ref. AKK), Midlands Electricity Board, P.O. Box No. 52, Blackpole Rd, Worcester.

Central Gloucestershire Area

AREA SECRETARY/ACCOUNTANT

Applicants should be qualified accountants and should have had wide experience in a public utility undertaking. The salary will be in accordance with N.J.M. Class C, Grade 6 (£2,380/£2,595 per annum).

Apply, by letter, within seven days, giving full details of age, qualifications, experience, present position and salary to the Secretary, Midlands Electricity Board, Mucklow Hill, Halesowen, nr. Birmingham.

F. W. CATER,
Secretary.
(D 53)

Eastern Electricity

Fens Sub-Area

COMMERCIAL OFFICER

254/61.R.

APPLICATIONS are invited for the above-mentioned appointment, preferably from Chartered Electrical Engineers.

The person appointed will be directly responsible to the Sub-Area Manager for the co-ordination of the activities of the commercial staff and should have had extensive experience in industrial, commercial, domestic and rural development.

Great importance is attached to the expansion of contracting work and the maintenance of a high and uniform standard of consumer service.

The appointment demands a man of considerable energy, and knowledge with practical experience in the application of tariffs to all classes of consumers in this predominantly rural Sub-Area.

Salary in accordance with Grade 5, Class C (£2,170/£2,380), of the National Joint Managerial and Higher Executive Grades Agreement.

Apply by letter to the Manager, Eastern Electricity, Fens Sub-Area, Milton Hall, Milton, Cambridge, by 20 Dec., 1961.

Chilterns Sub-Area

LUTON DISTRICT

THIRD ASSISTANT ENGINEER

253/61.R.

Candidates should have had a sound technical training and suitable experience in the construction, operation and maintenance of H.V. and L.V. overhead and underground distribution systems, including substations.

Salary: N.J.B. Class J, Grade 9 (£1,115/£1,245).

Apply by letter to the Manager, Luton District, Eastern Electricity, 487 Dunstable Rd, Luton, by 22 Dec., 1961.

Essex Sub-Area

SOUTH WEST ESSEX DISTRICT

DISTRICT COMMERCIAL ASSISTANT

250/61.R.

Applications are invited from candidates having a good general education, sound technical training and experience in modern installation practice in domestic and commercial premises. Ability to prepare wiring specifications and estimates will be an advantage.

Salary: N.J.C. Grade 3, £820/£924, including London Weighting.

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Apply by letter to W. T. Langfield, Manager, South West Essex District, Eastern Electricity, Ashton Rd, Harold Hill, Romford, Essex, by 22 Dec., 1961.

Northmet Sub-Area

ST. ALBANS DISTRICT

DISTRICT COMMERCIAL ASSISTANT

(Ref. 1082) 251/61.R.

Candidates should be fully experienced in modern installation practice, able to prepare specifications and competitive quotations and be competent to design thermal storage heating schemes, particularly floor-warming. A sound knowledge of the tariffs and their application, including supply by special agreement is necessary.

Salary: N.J.C. Grade 3 (£780/£880).

Apply by letter to F. J. Drake, ASSOCIATE I.E.E., Manager, Eastern Electrcity, 107 St. Peter's St, St. Albans, by 18 Dec., 1961.

GENERAL ASSISTANT ENGINEER

(ENGINEERING DRAUGHTSMAN)

SUBSTATIONS DRAWING OFFICE

SUB-AREA ENGINEER'S DEPT.

(Ref. 1098) 252/61.R.

Candidates should have had a good technical training and experience in the layout of switchgear, transformers and associated equipment for outdoor and indoor type substations up to 33 kV.

Possession of an Ordinary National Certificate or equivalent qualification is desirable.

Salary: N.J.B. Class N, Grade 18 (£815/£920), including London Allowance.

Apply by letter to the Manager, Eastern Electricity, Northmet Sub-Area, Northmet Hse, Southgate, N.14, by 22 Dec., 1961. (D 54)

SOUTH OF SCOTLAND ELECTRICITY BOARD

APPLICATIONS are invited for the position of

FOURTH ASSISTANT ENGINEER

(PROTECTION)

in the Technical Section of the Chief Engineer's Department at Portobello, Edinburgh.

Applicants should possess a degree of Higher National Certificate in Electrical Engineering and preferably have had some experience in commissioning high voltage electrical apparatus and routine maintenance and testing of protective gear. Previous experience at the works of a manufacturer of the above equipment would also be an advantage. The scope of the work embraces equipment in the Board's generating stations and transmision system.

Salary: N.J.B. Class K, Grade 9 (£1,050/£1,325), Grade 10 (£980/£1,245) or Grade 11 (£900/£1,165).

Applications, quoting reference E33/61, should be submitted on the standard form to the Secretary, South of Scotland Electricity Board, Inverlair Ave, Glasgow S.4, not later than 15 Dec., 1961. (D 29)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

APPLICATIONS are invited for the position of

ASSISTANT ENGINEER

in the Generation Services Department of the West Midlands Division. N.J.B. service conditions, superannuable appointment, salary according to Class L, Grade 5, £1,440/£1,830 per annum.

Candidates should have a sound technical training to the standard of Higher National Certificate, together with wide experience in the operation and maintenance of power stations.

Apply, quoting Vacancy No. 292/61 MR on form AE6, available from the Regional Personnel Officer, 53 Wake Green Rd, Moseley, Birmingham 13, to be completed and returned by 18 Dec., 1961. (D 43)

CENTRAL ELECTRICITY GENERATING BOARD

South Wales Division

APPLICATIONS are invited for the following superannuable N.J.B. Schedule A appointments in the Divisional Transmission Department, South Wales Division.

FOURTH ASSISTANT ENGINEER

(OPERATION AND MAINTENANCE)

DIVISIONAL HEADQUARTERS, CARDIFF

Vacancy No. 302/ET/61.

Salary: Class K, Grade 9, Scale 10, £1,050/£1,325 per annum.

Candidates should have a sound theoretical knowledge and practical training with experience in the operation and maintenance of E.H.V. switchgear transformers and overhead lines.

Qualifications leading to corporate membership of the Institution of Electrical Engineers desirable.

FOURTH ASSISTANT ENGINEER

(MEASUREMENTS)

BASED AT NEATH DISTRICT OFFICE

Vacancy No. 303/ET/61.

Salary: Class K, Grade 10, Scale 9, £980/£1,245 per annum; or Grade 11, Scale 8, £900/£1,165 per annum, according to experience.

Candidates should preferably possess H.N.C. or qualifications leading to corporate membership of the Institution of Electrical Engineers.

The work will involve precision measurements by means of potentiometer equipment, integrating meters, indicating instruments and field testing work on measurement equipment. Assistance will also be given in acceptance testing of new generators, efficiency testing of existing plant, feeder flow metering, etc.

Opportunities will be given for broadening the experience of the successful candidate in the general engineering activities of the District.

FOURTH ASSISTANT ENGINEER

(TELECOMMUNICATIONS)

BASED AT CARMARTHEN DISTRICT OFFICE

Vacancy No. 304/ET/61.

Salary: Class K, Grade 10, Scale 9, £980/£1,245 per annum; or Grade 11, Scale 8, £900/£1,165 per annum, according to experience.

Applicants should preferably possess H.N.C. or qualifications leading to corporate membership of the Institution of Electrical Engineers and have had experience in automatic and line transmission telephone apparatus. Knowledge of remote control, telemetering or V.H.F. radio equipment would be an advantage.

The successful candidate would be working on equipment of the Board's Transmission System concerned with telecommunications and telemetering and would be encouraged to broaden his experience in the general engineering activities of the District.

Special application forms available from Establishments, Central Electricity Generating Board, South Wales Division, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 23 Dec., 1961. (D 44)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

APPOINTMENT OF DISTRICT MANAGER

APPLICATIONS are invited from suitably qualified candidates, with wide experience of the Electricity Supply Industry, for appointment as District Manager in the Wrexham District.

Salary payable in accordance with National Joint Managerial Grade 5, Class D (£2,380/£2,595).

Appointment subject to medical examination. Pension Scheme.

Applications should be submitted to the Establishments Officer at Board Headquarters, Love La, Pall Mall, Liverpool 3, so as to be received not later than 19 Dec., 1961. (D 47)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER

(TELECOMMUNICATIONS)

AREA BOARD HEADQUARTERS

ENGINEERING DEPARTMENT

(BASED ON KENDAL)

APPLICANTS should have wide experience of V.H.F. low power radio transmitting and receiving equipment, and should have some knowledge of automatic telephone equipment, supervisory equipment and telephone type relays generally.

The successful applicant will be required to service, maintain and develop the Board's radio and telephone installations in the northern part of the area. Possession of technical qualifications in communication engineering will be an advantage.

Salary Scale: £1,145/£1,410 p.a. Grade K.8. N.J.B. Conditions.

Applications on forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 18 Dec., 1961.

SECOND ASSISTANT DISTRICT ENGINEER

EAST DISTRICT, MANCHESTER

The duties will include the supervision of the erection and maintenance of substations and switchgear, laying and jointing of cables, and switching operations on the H.V. and L.V. systems within the District as required. Applicants should have had a wide general experience on the distribution side of electricity supply and be prepared to undertake standby duties. Corporate membership of the Institution of Electrical Engineers will be an advantage.

Salary Scale: £1,190/£1,325 p.a. Grade H.7. N.J.B. Conditions.

Applications on forms to be obtained from the Manager (Staff Vacancy), No. 1 Sub-Area, The North Western Electricity Board, Town Hall, Manchester 2, P.O. Box 493, and returned to him by 18 Dec., 1961.

FOURTH ASSISTANT DISTRICT ENGINEER

LEIGH DISTRICT

The duties include assisting the District Engineer in the construction, operation and maintenance of the 33 kV, 11 kV and low voltage distribution systems.

The possession of the H.N.C. and Graduate Membership of the Institution of Electrical Engineers would be an advantage.

Salary Scale: £965/£1,090 p.a. Grade J.11. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 2 Sub-Area, The North Western Electricity Board, 2 St. George's Rd, Bolton, and returned to him by 20 Dec., 1961.

FOURTH ASSISTANT DISTRICT

COMMERCIAL ENGINEER

(TECHNICAL SALES AND SERVICE)

BLACKPOOL DISTRICT

Applicants should have had experience in the development of heating load and other loads. Some experience in electrical contracting will be an advantage.

Salary Scale: £825/£940 p.a. Grade J.13. N.J.B. Conditions.

Applications on forms to be obtained from the Manager, No. 4 Sub-Area, The North Western Electricity Board, 40-41 Lune St, Preston, and returned to him by 16 Dec., 1961.

SENIOR DEMONSTRATOR

BURNLEY DISTRICT

Candidates must have a good knowledge of electrical appliances and be competent to give demonstrations and lectures in public halls, Service Centres and on consumers' premises.

The successful applicant will be required to assist in general service centre duties during normal hours of business.

Salary Scale: £700 x £25—£775 p.a. Grade 2. N.J.C. Conditions.

Applications on forms to be obtained from the Manager, No. 5 Sub-Area, The North Western Electricity Board, Jubilee St, Blackburn, and returned to him by 16 Dec., 1961. (D 34)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

APPLICATIONS are invited from suitably qualified engineers for the following appointments in the Technical Branch of the Regional Electrical Department.

(1) ONE THIRD ASSISTANT ENGINEER

(PROTECTION)

Grade 8, Class K (£1,145/£1,410 per annum, based on Leeds (Design Section) to undertake the checking of schematic diagrams, wiring diagrams and specifications for protective and control gear and associated apparatus. Site commissioning experience would be an advantage.

(2) TWO FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 10 or 11, Class K (£980/£1,245 or £900/£1,165 per annum), based on Leeds (Design Section) to assist with the work described under Vacancy (1).

(3) THREE FOURTH ASSISTANT ENGINEERS

(PROTECTION)

Grade 11, Class K (£900/£1,165 per annum), based on North Tees, Leeds and Rotherham, to assist with testing and commissioning of generators, transformers, switchgear, lines and cables and with the testing, commissioning and maintenance of protective gear and control and indicating equipment for switchgear and transformers.

In all cases experience in a switchgear manufacturer's works would be an advantage.

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 15 Dec., 1961. (D 18)

THE NORTH WESTERN ELECTRICITY BOARD

THIRD ASSISTANT ENGINEER

(PLANNING AND DESIGN)

AREA BOARD HEADQUARTERS

MANCHESTER

APPLICANTS must have had experience in high voltage distribution work, preferably including 33 kV systems.

The successful applicant will be required to undertake the detail design and contract engineering work on 33 kV substations associated with bulk supply points.

Preference will be given to applicants who hold the H.N.C., or equivalent, in Electrical Engineering.

Salary Scale: £1,145/£1,410 p.a., Grade K.8, N.J.B. Conditions.

Applications on forms to be obtained from the Secretary, The North Western Electricity Board, Cheetwood Rd, Manchester 8, and returned to him by 18 Dec., 1961. (D 31)

CENTRAL ELECTRICITY GENERATING BOARD

South Eastern Region

North Thames Division

APPLICATIONS are invited for the following appointment:

MAINTENANCE ENGINEER (ELECTRICAL)

GOLDINGTON GENERATING STATION

(BEDFORD)

(S.V. No. 1565)

Salary: N.J.B., Class H, Grade 6, Scale 11, £1,275/£1,410 per annum.

Applicants should possess the Higher National Certificate in Electrical Engineering or other equivalent qualifications and have had wide practical experience in electrical maintenance at a modern generating station.

Applications, quoting Reference S.V. No. 1565, stating age, qualifications, experience and present position, should be sent to the Assistant Regional Personnel Officer, Central Electricity Board, West Farm Pl, Chalk La, Cockfosters, Barnet, Herts, to arrive not later than 23 Dec., 1961.

F. W. SKELCHER,
Assistant Regional Director.
(D 28)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Project Group

SECOND ASSISTANT ENGINEER

(ELECTRICAL)

APPLICATIONS are invited for the appointment of Second Assistant Engineer (Electrical) at Rugeley Power Station site.

Applicants should be Corporate Members of the Institution of Electrical Engineers, or have qualifications admitting thereto, and should have experience in the design, manufacture and installation of modern power station electrical equipment.

The successful candidate will be responsible to the Site Resident Engineer for all electrical installation work on the power station.

The salary for this appointment will be within Scale 15 (£1,460/£1,830 per annum) of the National Joint Board Agreement.

Applications should be submitted to the Administrative Officer, Midlands Project Group, P.O. Box 314, Birmingham 30, not later than 18 Dec., 1961.

Envelopes should be marked "Confidential—Staff Vacancy No. MPG.71/61."

(D 27)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 2 Sub-Area

ASSISTANT CONSUMERS' ENGINEER

REQUIRED in the Runcorn District of the Board's No. 2 Sub-Area. Salary within range £670/£750 per annum (N.J.B. G/14, Scale 2).

This is an active and interesting post which offers good future prospects to a suitable applicant. Staff conditions of service including sick pay, holiday and pension schemes.

Duties will include estimating for contracting work and advising consumers on matters relating to electricity supply and the utilisation of electrical equipment. A technical qualification is desirable.

Appointment subject to medical examination.

Application forms obtainable from the Manager, No. 2 Sub-Area, Sandiway Hse, Northwich, Cheshire. Closing date: 22 Dec., 1961. (D 70)

CENTRAL ELECTRICITY GENERATING BOARD

North Eastern Region

REGIONAL ELECTRICAL DEPARTMENT

APPLICATIONS are invited for the following appointments in the Transmission Project Branch Drawing Office of the Regional Electrical Department, based on Leeds.

GENERAL ASSISTANT ENGINEERS

(DRAWING OFFICE)

OVERHEAD LINES AND CABLES

Grades 12-16, Class BX (£715/£1,090).

Applicants should have had adequate technical training and some experience of profile plotting for overhead lines employing steel lattice towers, together with the preparation of clearance drawings. The successful applicants will be required to undertake this type of drawing work on 275 kV and 132 kV overhead lines, but similar experience on lower voltage lines may be acceptable. Some knowledge of the preparation of route maps and cable records would be an advantage.

GENERAL ASSISTANT ENGINEERS

(DRAWING OFFICE)

ELECTRICAL

Grades 12-16, Class BX (£715/£1,090).

Applicants should have adequate technical training and drawing office experience suitable for work in connection with the layout of 275 kV and 132 kV grid substations. Some experience in the preparation of schematic and wiring diagrams, power and multicore cable layouts and schedules will be an advantage.

Forms of application may be obtained from the Regional Personnel Officer, Central Electricity Generating Board, North Eastern Region, 1 Whitehall Rd, Leeds 1, to whom they should be returned to arrive not later than 31 Dec., 1961. (D 51)

ELECTRICAL ENGINEER

required for Leeds works to take charge of floor-heating cable manufacturing section. Salary £850 per annum. 5-day week. Superannuation scheme. Excellent prospects for promotion in rapidly expanding organisation.

Box No. 8503, Electrical Times.

(D 46)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

ASSISTANT ENGINEER (CONTROL ROOM)

LEICESTER POWER STATION

Vacancy No. 252/61.

APPLICATIONS are invited for the position of Assistant Engineer (Control Room) at Leicester Power Station, Rawdykes Rd, Leicester.

Candidates for this post should be suitably qualified and preferably have had power plant experience.

Salary will be in accordance with Class G, Grade 13 (£715/£805 per annum) of the National Joint Board Agreement. plus £90 per annum allowance whilst engaged on shift duties, and the position will be pensionable within the terms and conditions of the Electricity Supply (Staff) Superannuation Scheme.

Closing date for receipt of applications: 22 Dec., 1961.

Applications should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.

(D 64)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 1 Sub-Area

ASSISTANT CONSUMERS' ENGINEER

REQUIRED in the Liverpool North District of the Board's No. 1 Sub-Area. Salary is within the range £765/£870 per annum (N.J.B. J/14).

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances. Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Standard application forms should be forwarded to the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, within 14 days from today's date. (D 66)

OPPORTUNITIES FOR CABLE ENGINEERS

(ELECTRICAL)

Vacancies exist at an expanding electrical cable factory in the London Area.

Applicants are required for posts in the development and engineering depts. Knowledge of cable designs an advantage. Minimum qualifications H.N.C. Salary commensurate with ability. Attractive superannuation scheme available.

Write full details, Box No. 8495, Electrical Times. (D 20)

TO ALL ELECTRICAL DESIGN ENGINEERS AND DRAUGHTSMEN

We are shortly moving into a new modern office building and have vacancies for design engineers and draughtsmen who are interested in installation design in all classes of industrial and commercial buildings including

AIRPORTS - NEW HOSPITALS - HOTELS
OFFICE BLOCKS - UNIVERSITIES - SCHOOLS

both at home and abroad.

Spring and summer holidays, pension scheme and luncheon vouchers. Apply in writing, stating age, experience, qualifications, present salary and salary required, to:

J. ROGER PRESTON AND PARTNERS,
15 North Audley St, London W.1.

(D 75)

J. & P. **ASSISTANT TO CHIEF DRAUGHTSMAN**

Johnson & Phillips Ltd. invite applications for the position of Assistant to Chief Draughtsman in their Switchgear Department, at their works in London. This is a responsible position in an expanding department whose activities are world-wide.

Candidates must have practical and D.O. experience in l.v. and h.v. industrial switchgear. Applications—which will be treated in confidence—stating age, training and experience, should be addressed to:

The Employment Manager,
JOHNSON & PHILLIPS LTD.,
Charlton, London S.E.7.

(D 78)

MANCHESTER CORPORATION TRANSPORT DEPARTMENT

require

JUNIOR ENGINEER (ELECTRICAL)

To assist with technical investigations appertaining to electrical work for vehicle operation (including trolleybus high tension equipment) and installations in building. Salary: £815/£960 per annum.

Application forms and details of duties and conditions from General Manager, 55 Piccadilly, Manchester 1. Returnable by 18 Dec., 1961.

(D 81)

CROMPTON PARKINSON LIMITED

SERVICE ENGINEER

(LONDON AREA)

An intelligent young man in the 20/25 years age group, resident in the London area, is required as a Service Engineer.

He should have had practical experience in the manufacture, maintenance or repair of fractional motors, and must have a knowledge of electrical machinery.

Preference will be given to applicants with a Higher National Certificate in electrical engineering, but consideration will be given to those with Ordinary National Certificate who are prepared to continue their studies at evening classes.

This appointment will carry a good starting salary and is progressive and pensionable.

Apply by letter giving all essential details to: The Chief Personnel Officer, Crompton Parkinson Ltd., Crompton Hse, Aldwych, W.C.2. (D 36)

BICC

BRITISH INSULATED CALLENDER'S CONSTRUCTION CO. LTD.

SITE ENGINEERS

for construction of high steel towers, television masts and overhead power transmission lines, in all parts of United Kingdom and Overseas.

Applicants should preferably be in the age group 21-30.

Experience in this class of work is desirable and Civil Engineering qualifications would be an asset.

Write stating details of experience, age and salary required to:

Staff Officer,
B.I.C. Construction Co. Ltd.,
30 Leicester Sq,
London W.C.2.

(D 45)

CONSTRUCTORS JOHN BROWN LIMITED

have vacancies for

SUPERVISING ELECTRICAL ENGINEERS

Applicants should have served a full apprenticeship with a reputable electrical contractor, possess a recognised technical qualification and have experience of large industrial and flame-proof installations from estimating to final account stage.

The successful candidates would be required to reside on sites in the U.K. and abroad for periods of from one to two years. Good salaries and allowances. Contributory Pension Scheme with Life Assurance benefits.

Please apply in writing, giving details of age, experience and qualifications, to:

Personnel Manager,
CONSTRUCTORS JOHN BROWN LTD.,
CJB House, Eastbourne Terrace,
Paddington, London W.2

quoting ref. no. N9504.

(D 77)

CENTRAL ELECTRICITY GENERATING BOARD

Western Division

ER/AV/118/61.

ASSISTANT CHEMIST

required at Hinkley Point Nuclear Power Station, nr. Bridgwater, Somerset.

Superannuation Scheme. Salary: N.J.B. Class O, Grade 12, Scale 11, £1,275/£1,410 per annum. Good sick pay and holiday schemes are in operation.

Applicants should be experienced in power station chemistry, and be adaptable to new techniques. Possession of the H.N.C. in Chemistry or an equivalent qualification would be an advantage.

Applications on Form AE6/ACT, obtainable from the Personnel Department, 26 Oakfield Rd, Bristol 8, should be completed and returned by Friday, 29 Dec., 1961. (D 73)

BRITISH RAILWAYS — LONDON MIDLAND REGION

MECHANICAL & ELECTRICAL ENGINEER (DEVELOPMENT)

required at DERBY H.Q.

Applications are invited from University Graduates and/or Corporate Members of one of the professional Engineering Institutions, with experience in large-scale design administration, preferably in the field of Railway Traction or Vehicle design, for the post of Development Engineer at Derby with British Railways.

The successful applicant would be responsible to the Chief Mechanical & Electrical Engineer for all design and development in the London Midland Region of British Railways.

Salary within the range £2,475 to £3,300 p.a. according to experience. Concessionary rail travel and superannuation scheme.

Preference will be given to applicants in the age group 40-50.

Applications which should contain full biographical details, should be sent to:—

General Manager,
British Railways, London Midland Region,
Euston Station, London, N.W.1.

(D 26)

CENTRAL ELECTRICITY GENERATING BOARD

West Midlands Division

ASSISTANT ENGINEERS (RELIEF)

REQUIRED at Coventry Power Station. N.J.B. Service Conditions, superannuable appointments, salary within Schedule A, Grade G.12, £765/£870 per annum plus £90 shift allowance.

The successful applicants will be expected to carry out shift relief duties to the Control Engineers and when not so employed will be available to undertake duties in the maintenance and operation departments. Shift allowance as laid down in the N.J.B. Agreement will be paid when shift duties are worked.

Applicants should have received a sound technical training and appropriate qualifications will be an advantage.

Apply, quoting Vacancy No. 295/61MR on form AE6, available from the Station Superintendent, Coventry Power Station, Alderman's Green, Coventry, Warwicks, to be completed and returned not later than 18 Dec., 1961. (D 60)

SEB

ASSISTANT ENGINEER (PLANNING)

YEOVIL District of No. 4 (Bournemouth) Sub-Area. Salary: N.J.B. Class G, Grade 11 (£825/£940 per annum). N.J.B. Conditions of Service.

The successful candidate will be required to assist in the preparation of Schemes and estimates for extensions of, and reinforcement to, overhead and underground H.V. and L.V. networks. Applicants should have had sound experience in Electricity Supply Distribution, and the possession of suitable technical qualifications would be an advantage. The successful candidate will be required to carry out standby duties if and when called upon to do so.

Applications on forms obtainable from the Sub-Area Secretary, 1 Priory Rd, Bournemouth, Hants, and returned to him, quoting Z.1431, not later than 18 Dec., 1961.

ASSISTANT ENGINEER (PLANNING)

Basingstoke District of No. 3 (Portsmouth) Sub-Area. Salary: N.J.C. Class F, Grade 11 (£765/£870 per annum). N.J.B. Conditions of Service.

The duties of the post will be to assist in the preparation of schemes and estimates for extensions of, and reinforcement to, overhead and underground H.V. and L.V. networks, and to undertake standby duties if required. Suitable technical qualifications are necessary.

Applications on forms obtainable from the Sub-Area Secretary, Lower Drayton La, Cosham, Portsmouth, and returned to him, quoting Z.1448, not later than 18 Dec., 1961.

The successful candidates for the above appointments will be required to contribute to the Electricity Supply (Staff) Superannuation Scheme, if elegible. (D 63)

THE EAST MIDLANDS ELECTRICITY BOARD

APPLICATIONS are invited from suitably qualified and experienced persons for the following appointment. Applicants should state age, qualifications, experience, etc., and quote the vacancy number.

Northamptonshire Sub-Area

THIRD ASSISTANT DISTRICT ENGINEER

BLETCHLEY DISTRICT

Vacancy No. 130/61.

Salary: N.J.B. Class F, Grade 9, £890/£1,015 per annum.

The duties include assisting in the operation, maintenance, planning and construction of rural and urban networks up to and including 11 kV.

The person appointed will be required to live in or near Bletchley, and to undertake standby duty.

Applications should be forwarded to the Manager, Northamptonshire Sub-Area, 25 Bridge St, Northampton, by 22 Dec., 1961. (D 55)

CENTRAL ELECTRICITY GENERATING BOARD

South Western Region

APPLICATIONS are invited for the following superannuable N.J.B. appointments of

STATION SHIFT CONTROL ENGINEERS

in the South Wales Division.

UPPER BOAT POWER STATION

NEAR PONTYPRIDD, GLAM

Vacancy No. 313/ET/61.

Salary: Class H, Grade 10, Scale 7, £965/£1,090 per annum.

CARMARTHEN BAY POWER STATION

BURRY PORT, CARMS

Vacancy No. 314/ET/61.

Salary: Class K, Grade 10, Scale 9, £1,115/£1,245 per annum.

Applicants should possess H.N.C. or equivalent qualifications and have had operating experience in a modern power station.

Ten per cent shift allowance applies in each case.

Special application forms are obtainable from the Central Electricity Generating Board, Personnel Department, Twyn-y-fedwen Rd, Gabalfa, Cardiff, to be returned by 23 Dec., 1961. (D 59)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

FITTERS (ELECTRICAL)

REQUIRED in the Liverpool North, South and Central Districts of the Board's No. 1 Sub-Area.

Rate of pay 66·75d per hour (42-hour five-day week). N.J.I.C. conditions. Pension scheme.

Applicants should be experienced in the erection of 33 kV and 11 kV switchgear, and also have a knowledge of general sub-station construction work.

Applications in writing should be forwarded to the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3.

Closing date: 22 Dec., 1961. (D 67)

CORPORATION OF GLASGOW

Architectural and Planning Department

ASSISTANT ENGINEER (ELECTRICAL)

APPLICATIONS for the above superannuable appointment are invited from graduates and associate members of the Institution of Electrical Engineers. Salary scale: £850/£1,560, with placing according to qualifications and experience. There is a point within the scale at which increments may be accelerated.

A five-day week is in operation.

Advances up to 100% of valuation will be made available where needed for the purchase of suitable houses in or near Glasgow, to successful applicant.

Form of application may be obtained from the Principal Administrative Officer, Architectural and Planning Department, 20 Trongate, Glasgow C.1. (D 56)

BRITISH JEFFREY-DIAMOND LTD.,

require the services of a qualified

MOTOR DESIGNER

to undertake electrical and mechanical design of A.C. machines for the mining industry in this country and abroad. Special purpose machines in a quickly advancing field of application are involved and the position offers wide scope in a well established and expanding concern.

Write to the Secretary at Stennard Wks, Wakefield, giving details of experience and technical qualifications and quoting Ref. ENG. 2. (D 40)

TECHNICAL SALES ENGINEERS

Qualified Sales Engineers are immediately required for Eastern and the Midland sales territories. Knowledge of miniature and moulded case circuit-breakers plus automatic motor control gear essential, with ability to negotiate at all levels in the associated marketing fields. Applicants should reside in or near Birmingham, Nottingham, Norwich or Ipswich.

Company car provided, plus non-contributory pension scheme, with ample opportunities for advancement in this rapidly expanding Company.

Replies to:

The Technical Sales Manager,
Chilton Electric Products Ltd.,
Hungerford, Berkshire.

(D 74)

CENTRAL ELECTRICITY GENERATING BOARD

Midlands Region

East Midlands Division

GENERAL ASSISTANT ENGINEER

(MECHANICAL MAINTENANCE)

Vacancy No. 246/61

GENERAL ASSISTANT ENGINEER

(ELECTRICAL MAINTENANCE)

Vacancy No. 247/61.

STAYTHORPE "A" AND "B" POWER STATIONS

APPLICATIONS are invited for the above vacancies at Staythorpe "A" and "B" Power Stations, near Newark, Notts.

Preference will be given to candidates who hold the Higher National Certificate or who are at present pursuing a course of study with the object of obtaining this or a similar qualification.

Salary will be in accordance with Class M, Grade 16 (£825/£940 per annum), of the National Joint Board Agreement, and the positions will be pensionable within the terms and conditions of the Electricity Supply Industry.

Closing date for receipt of applications: 15 Dec., 1961.

Applications, quoting appropriate Vacancy No., should be submitted on the official form AE6/ACT, which may be obtained from the Station Superintendent and should be returned to him by the date stated.

O. S. WOODS,
Assistant Regional Director.
(D 52)

SOUTH EASTERN GAS BOARD

ELECTRICAL ENGINEERING ASSISTANT

EAST GREENWICH

AN Electrical Engineering Assistant is required for the Board's East Greenwich Works to assist the Electrical Superintendent in operational control and supervision of plant installation and maintenance at the Station.

The East Greenwich site covers a large area and there is an extensive extra high tension and medium voltage distribution system with associated substation equipment. Alternating current motors are extensively used and there is Mercury-arc rectifier equipment with d.c. motors for certain special duties. Power is supplied from a power station with an installed capacity of 6,500 kW equipped with condensing and pass-out steam turbo-alternator sets.

Applicants should, therefore, have practical industrial experience and technical

continued in next column

continued from previous column

knowledge in the installation and maintenance of such equipment on a large scale.

Possession of a Higher National Certificate or equivalent qualification in Electrical Engineering is desirable.

Salary within range £1,015/£1,220 according to qualifications and experience.

Applications in writing, quoting reference V19/1536 and giving full details, should be sent to the Personnel Manager, South Eastern Gas Board, Katharine St, Croydon, within seven days. (D 58)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD

No. 4 Sub-Area

CONSUMERS' ENGINEER

REQUIRED in the Anglesey District, based on Holyhead.

Salary within the range £890/£1,015 per annum (N.J.B. E.8, Scale 6).

Applicants must have had a sound technical training and experience within the industry in dealing with:

(a) designing and estimating for all types of electrical installation work;

(b) advising consumers on tariffs, appliances and all aspects of electricity utilisation;

(c) organisation of Service Centres and exhibitions;

(d) control of manual and administrative staff.

Appointment subject to medical examination. Pension scheme.

Application forms obtainable from the Manager, No. 4 Sub-Area, Electricity Hse, Rhostyllen, nr. Wrexham.

Closing date: 22 Dec., 1961.

Previous applicants need not re-apply. (D 65)

THE SOUTH WALES ELECTRICITY BOARD

FOURTH ASSISTANT ENGINEER

(PROTECTION)

APPLICATIONS are invited for the position of Fourth Assistant Engineer (Protection) in the Chief Engineer's Department, based at Cwmbran.

Preference will be given to engineers possessing the Higher National Certificate in Electrical Engineering.

Salary: N.J.B. Class J, Grade 9, transitional to Scale 9 (£1,040/£1,115/£1,245 per annum).

Applications stating age, present position, present salary and experience, should be addressed to the undersigned at St. Mellons, Cardiff, to arrive not later than 27 Dec., 1961.

Please quote reference 139/61/ET, endorsing envelope "Fourth Assistant Engineer (Protection)."

R. G. WILLIAMS,
Secretary.
(D 50)

SAMUEL FOX & COMPANY LTD.

SENIOR DRAUGHTSMAN

required for the Electrical Drawing Office of large steelworks.

The position gives valuable opportunity to applicants having varying degrees of experience.

Commencing salary will be in accordance with ability and previous experience in steelworks electrical design and installation work.

Applications should be made in writing to:

The Labour Manager,
Messrs Samuel Fox and Co. Ltd.,
Stocksbridge Works, nr. Sheffield.

(D 49)

SOUTH EASTERN ELECTRICITY BOARD
DISTRICT COMMERCIAL ASSISTANT
BRIGHTON AND HOVE DISTRICT

SALARY: £700 x £25—£775 p.a. under N.J.C. Grade 2. Applicants should have experience in dealing with consumers' inquiries, possess a good general knowledge of domestic appliances and tariffs and have the ability to estimate for wiring work.

Applications, quoting ET and naming two referees, to District Manager, Seeboard, Electric Hse, Castle Sq, Brighton, by 18 Dec., 1961.

GEORGE WRAY,
Secretary.
(D 62)

MERSEYSIDE AND NORTH WALES ELECTRICITY BOARD
No. 1 Sub-Area
ASSISTANT CONSUMERS' ENGINEER

REQUIRED in the Southport District of the Board's No. 1 Sub-Area. Salary is within the range of £670/£750 per annum (N.J.B. F/13).

Duties include estimating for contracting work and advising consumers on electricity supply matters and appliances.

Technical qualifications desirable.

Appointment subject to medical examination. Pension scheme.

Standard application forms should be forwarded to the Manager, No. 1 Sub-Area, 24 Hatton Gdn, Liverpool 3, within 14 days of today's date. (D 68)

APPLICATIONS are invited for the position of PRODUCTION TECHNICAL ASSISTANT in a North London Lamp making Company. Minimum qualification required O.N.C. (Electrical) or equivalent. A permanent position offering an excellent opportunity for a man of initiative and ambition. Write stating age, qualifications, experience, present salary to Box No. 8499, Electrical Times. (D 39)

A NATIONAL INDUSTRIAL ELECTRICAL WHOLESALER, with an expanding organisation, is looking for a SENIOR SALESMAN with a dynamic approach to selling and especially a man who is seeking advancement to management.

The appointment is in the Midlands and excellent prospects are offered to the right man who should already be earning at least £1,000 p.a.

Apply, giving full details of career to the Sales Director, Box No. 8491, Electrical Times. (D 19)

BRITISH ENGINE BOILER AND ELECTRICAL INSURANCE CO. LTD., Longridge Hse, Manchester 4. ELECTRICAL SURVEYORS required. Permanent positions carrying progressive salary scale £825/£1,225, with non-contributory pension. Candidates aged 26 to 32, with H.N.C. in Electrical Engineering or Grad. I.E.E., and with apprenticeship in manufacture or repair of electrical machinery, are invited to apply stating age, qualifications and experience. (D 72)

COMMERCIAL SALES ENGINEER required by merchant company operating in the Far East for service in the Federation of Malaya. Minimum qualification O.N.C. (either Mech. or Elect.); age about 25. Good salary, scale according to qualifications and experience; excellent prospects. Annual increments; provident fund; non-contributory pension scheme; free furnished accommodation; passage provided. Write, Box No. 2076, c/o Abbotts, Eastcheap, London E.C.3. (D 71)

CHRISTY BROS. LTD., of Chelmsford, require a JUNIOR ELECTRICAL ENGINEER in their Consulting Section. Capable of planning and designing with the minimum of supervision. Salary according to experience and age. Full details with application. (D 48)

Box No. replies to be addressed to the ELECTRICAL TIMES, Sardinia House, Sardinia Street, London, W.C.2

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will provide a basis for work in the field of radiation protection. The course consists of approximately 100 formal lectures and 200 hours of laboratory experiments and tutorials. On successful completion of this basic course, candidates may continue for a further nine months to complete

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The Secretary (H.P.),
The Royal College of Science and Technology,
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(D 21)

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THE proprietor of British Patent No. 626068, entitled "Improvements in or relating to automatically controlled electrical pumping units," offers same for licence or otherwise to ensure practical working in Great Britain. Inquiries to Singer, Stern and Carlberg, 140 So. Dearborn St, Chicago 3, Illinois, U.S.A. (D 13)

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PRESTON (D 10)

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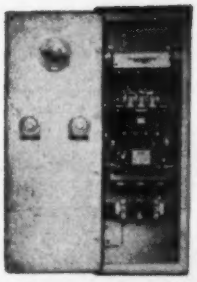

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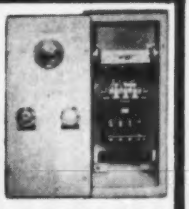

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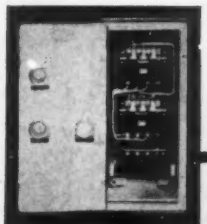

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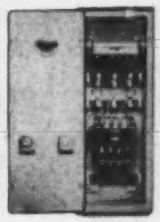

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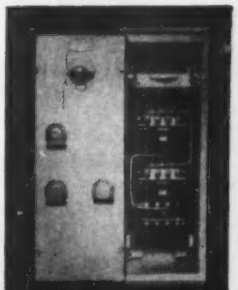

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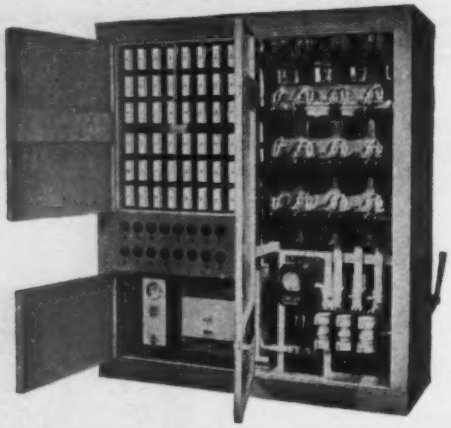

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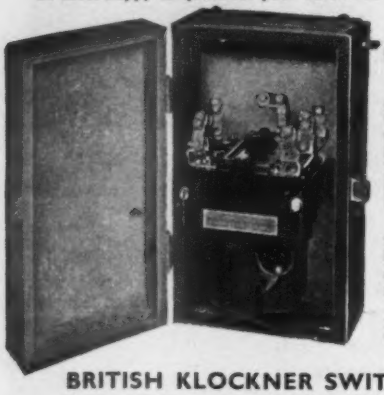

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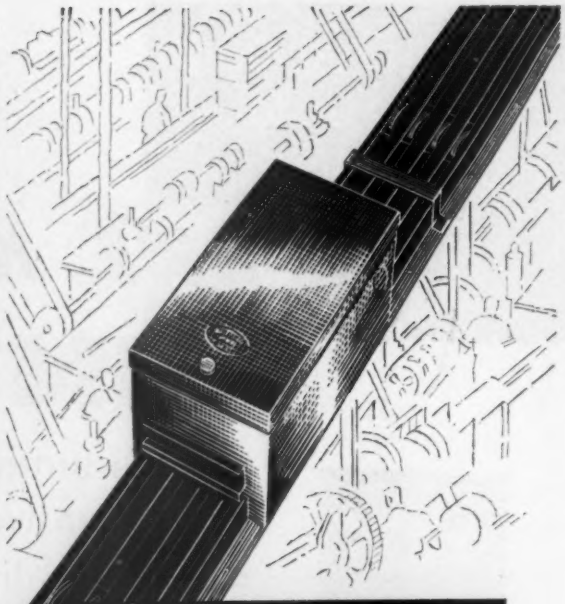

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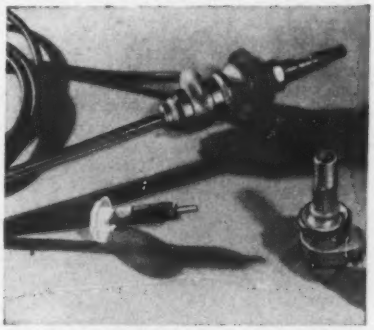
A new I.C.I. material for the Electrical industry



'Valan' car aerials made by Valan Electricals Ltd., with components for mounting moulded in 'Propathene' by D. A. Wilkes & Co. Ltd., 1034 Yardley Wood Road, Warstock, Birmingham 4.

'PROPATHENE' is a new polyolefine thermo-plastics material made by I.C.I. from propylene – a hydrocarbon gas in the same family as ethylene from which I.C.I.'s well known 'Alkathene' range of polythenes is produced. 'Propathene' is available in grades suitable for manufacturing complicated injection mouldings, extruded cable insulation and sheathing, sheets and thin films. Like all polyolefines it has excellent dielectric properties, high chemical resistance and very low specific gravity. Polypropylene is however outstanding amongst polyolefines in its retention of rigidity at temperatures well above 100°C.

First components in 'Propathene'

'Propathene' is already causing interest in the fields of electrical and radio engineering. The car aerials and floatswitch boxes illustrated are just two of the components already available in this material.

The following summary of the special properties of 'Propathene' in relation to the electrical industry will give some idea of the wide potential of this material. It is of course impossible to give here more than a brief survey of these properties. Full information is always available from I.C.I.

Good electrical properties through a wide range of temperatures and frequencies

The D.C. volume resistivity of 'Propathene' is greater than 10^{17} ohm cm. and the dielectric constant remains near 2.2 over a wide frequency range. Both are virtually independent of temperature.

Power factor is normally in the region 0.0003 to 0.001, depending upon both frequency and temperature. Room temperature power factor is about 0.0008 at 50 c/s, increasing to 0.001 at 10,000 c/s, and decreasing to 0.0003 at 50 Mc/s; limited evidence suggests a further fall to 0.00015 at 600 Mc/s. As the temperature changes, the power factor at a given frequency goes through a peak. At all frequencies higher than 2,000 c/s this peak occurs above the maximum service temperature of 'Propathene', and the effect of temperature thus becomes less important as the frequency is increased. The highest power factor is about 0.004, and is reached near maximum working temperature at 50 c/s. *At high or low frequencies, therefore, at temperatures up to 140°C, the electrical properties of 'Propathene' are far better than many existing insulating materials, making 'Propathene' an invaluable addition to the range of dielectrics available to electrical and radio engineers.* A great deal of work is taking place in the I.C.I. research laboratories both investigating and improving still further the electrical properties of 'Propathene'.

Useful life of 20 years or more

Laboratory tests indicate that the life of a 'Propathene' article in reasonable conditions, at temperatures up to about 80°C is probably 20 years or more. Articles made from 'Propathene' may be used where high temperatures, even up to 150°C, are experienced intermittently, but on heating in the presence of oxygen, oxidation occurs. The rapidity of this process depends on the environment. In a slow moving air stream it will be less rapid: similarly a bulky 'Propathene' article will submit to oxidative breakdown more slowly than one of smaller size. For any application where the material will be exposed to high temperatures for prolonged periods, high heat stability grades of 'Propathene' are available.

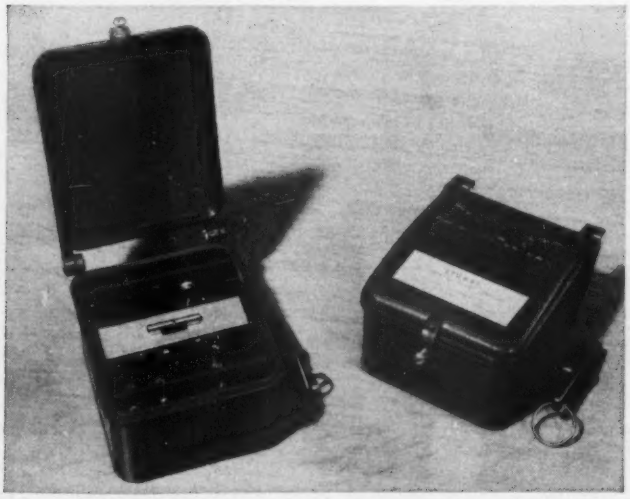
Improvements in oxidation resistance

It is known that the life of 'Propathene' at elevated temperatures is considerably shortened by contact with oxidising agents and certain metals, particularly copper and copper alloys. I.C.I. are carrying out a great deal of research into this matter and have already made considerable improvements in the resistance of 'Propathene' to oxidation in the presence of copper. It is not thought that the presence of copper or copper alloys is of any significance at temperatures below 60°C. when high heat stability grades are used. *Thus 'Propathene' may be used in a great number of electrical applications involving contact with copper or copper alloys, with no problems arising whatsoever.*

Rigidity . . . low water absorption

'Propathene' is a rigid material and it retains useful rigidity at quite high temperatures. At really high temperatures, up to 145°C., thin-walled articles in 'Propathene' lose considerable rigidity, but they do not lose shape and can be handled without distortion or used in applications where no stress is applied to them. The moisture absorption of 'Propathene' is very low, so that in service there are no dimensional changes due to variations in humidity. The mould shrinkage of 'Propathene' is usually between 1 and 2% but the after-mould shrinkage of 'Propathene' is so small that it is of no consequence in most applications.

It is not possible to give more than a brief summary of the properties of this outstanding material in this article, nor can we list all its potential applications. To find out more about 'Propathene', please write to I.C.I. at the address below.



Floatswitch boxes moulded from 'Propathene' by Henley Plastics Ltd., Reading Road, Henley-on-Thames, for Stuart Turner Limited, Henley-on-Thames, to be used with Stuart pumps.

'Propathene'

'Propathene' is the registered trade mark for the polypropylene manufactured by I.C.I.

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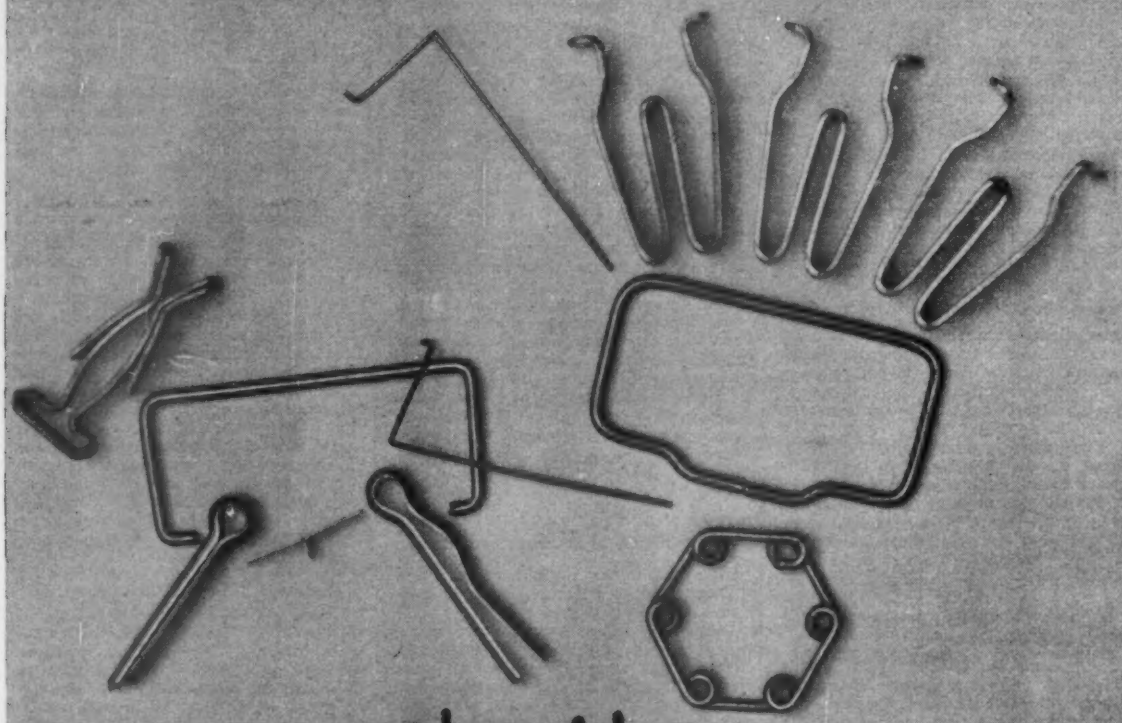

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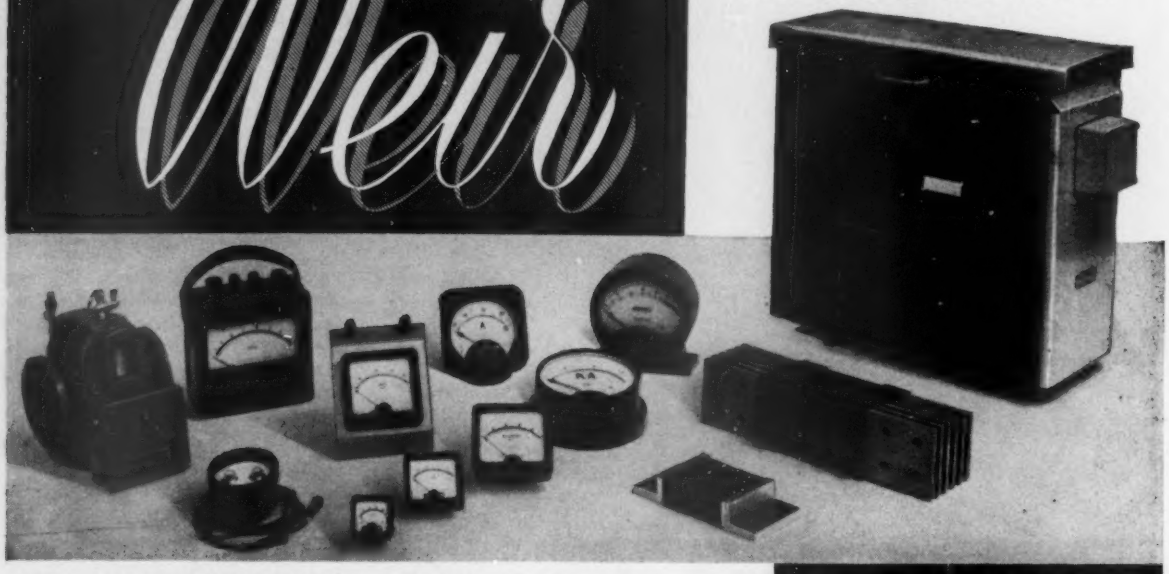

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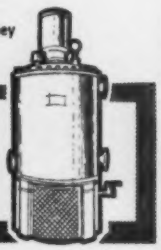

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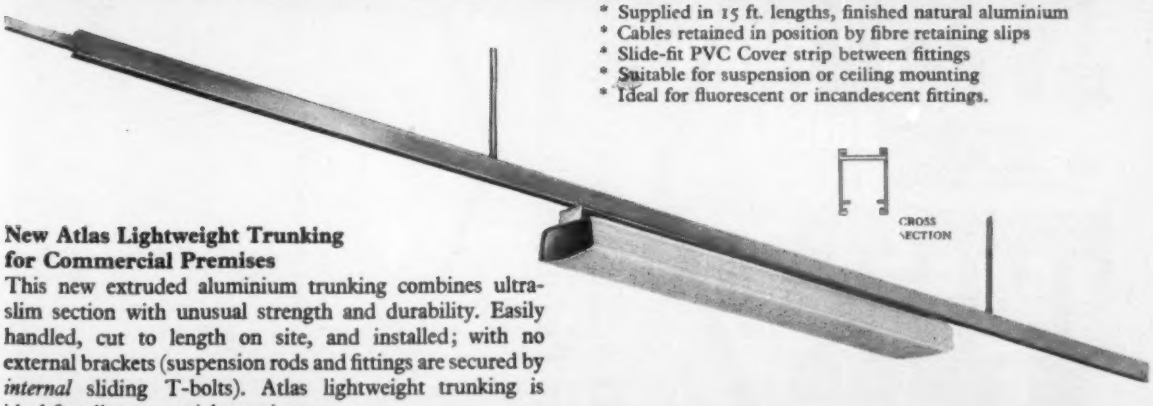
This new heavy duty trunking is designed for use with Atlas Atlantic 2 fittings or *any* standard fittings... fluorescent, incandescent or discharge types. Versatility, good looks, extreme strength, flexibility, *complete* accessibility from below, easily the fastest installation time . . . these features make Atlas Atlantic Trunking an ideal choice.



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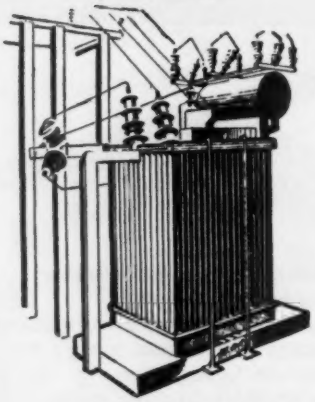

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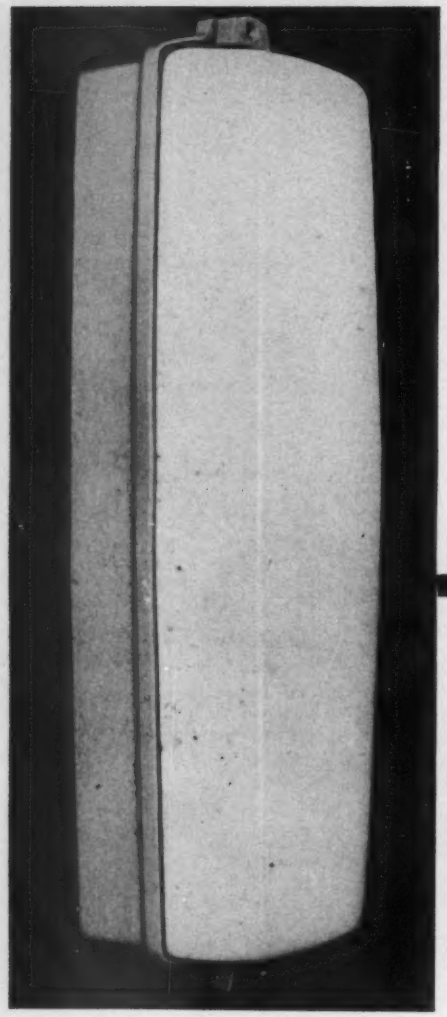
BULKHEAD & FITTINGS BY



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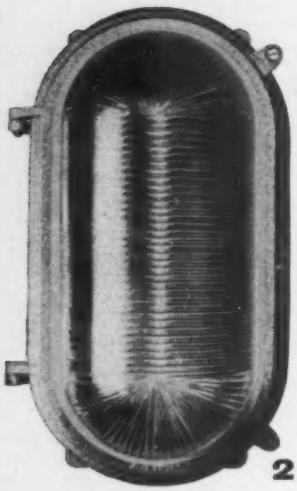

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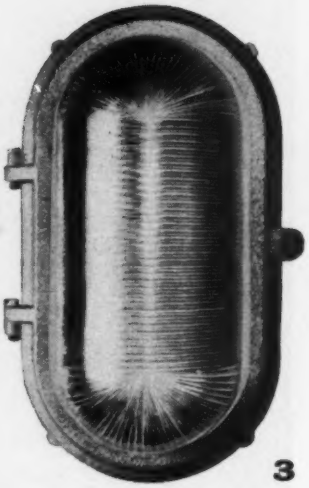

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The Revo range of high quality Bulkhead fittings is designed to operate in all kinds of adverse weather conditions for long periods and with a minimum of maintenance. Selected from this range are: 1. Fluorescent Bulkhead for 12" tubes (one, two or three) with acrylic plastic cover. 2. Aluminium and 3. Cast Iron Bulkheads (the latter galvanised if required) for 150 watt lamps. Prismatic glass covers. 4. Recessed and 5. Surface mounted "Silver Ring" Bulkheads. Choice of opalescent, or axial or symmetric prismatic glass fronts. All are finished in hammered grey stove enamel. Our illustrated leaflet gives full information.

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WELLGLASS
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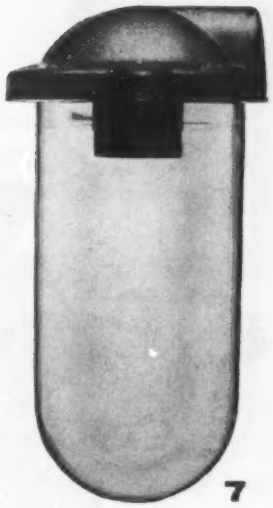
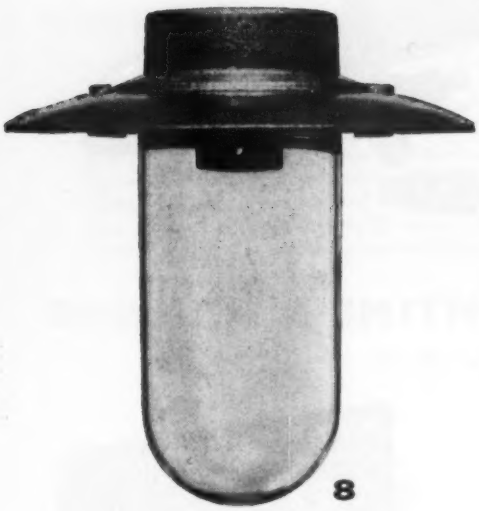


7

Four standard fittings (Nos. 6, 7, 8 and 9) are illustrated on this page and each is available in either Die-cast aluminium alloy or cast iron, Stove enamel hammered grey finish or galvanised cast iron. Clear wellglass is mounted on a rubber seating washer and is located by two fixing lugs designed to allow removal of glass without detaching screws. 40, 60 or 100 watt tungsten lamps are suitable for these fittings. Wire guards and matching backplates and brackets are available if required. For full details refer to our leaflet which is obtainable from the address below.



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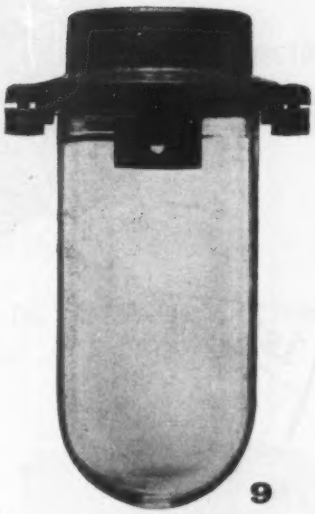

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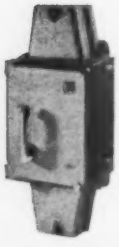
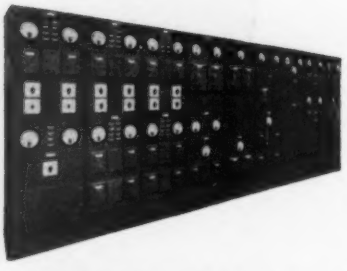


Type T.S. Standardised Switches — front handle operation, compact design. Available in 30, 60, 150, 300, 500 and 750A ratings.



A typical nine-section cubicle switchboard showing the adaptability and flexibility of the CUBICON system. Can be Dorman factory built or assembled on site from CUBICON standardised components.

some real winners in 80 years

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Lighting fittings—streamlined distribution boards—
unit-built metalclad switchboards—standardised
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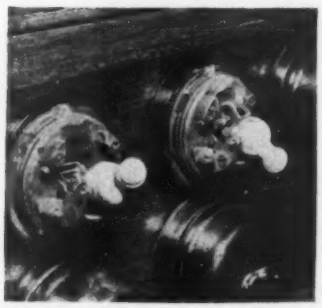
cubicle boards—miniature circuit breakers

A lighting fitting pioneered by us in the 1880s, incorporating the base loop lamp, the filament wires projecting through the bulb and hooked on to the spring terminals in the lampholder. Crude? yes; but it worked!



The tumbler switches shown above were in daily use at our Manchester factory, for over 60 years! Note the remarkable condition of the contacts, and the robust porcelain base. We were the first company in Britain to make tumbler switches, and the first to use porcelain as an insulator.

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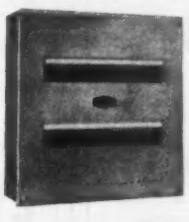
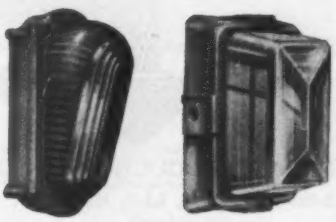


Loadmaster Distribution Boards, 250/440v. A.C. S.P. & N., D.P. & N. T.P. & N., up to 16 ways, in five basic case sizes. The most comprehensive range available.



Examples from our current range of prismatic lighting fittings which include industrial, heavy duty, architectural, handlamps and cargo cluster patterns.

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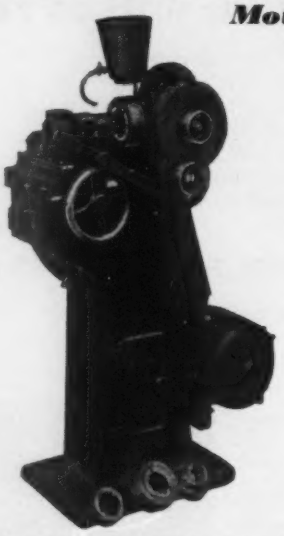

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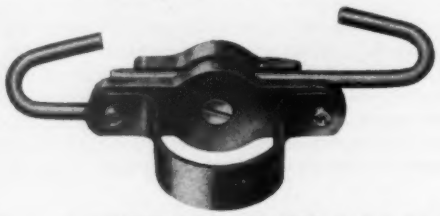

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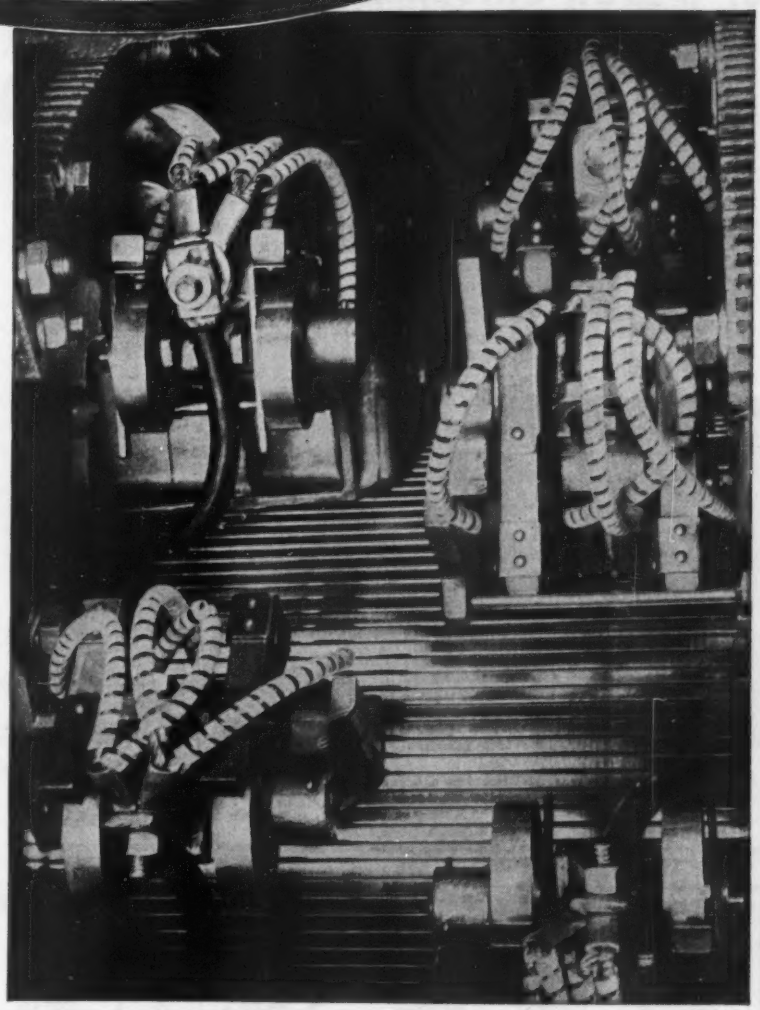

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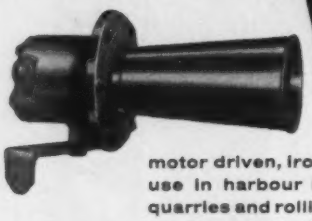

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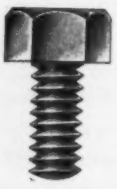

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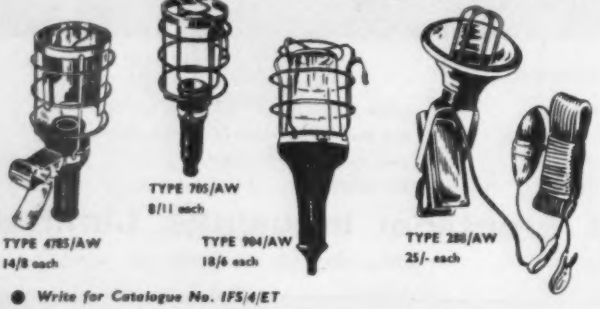

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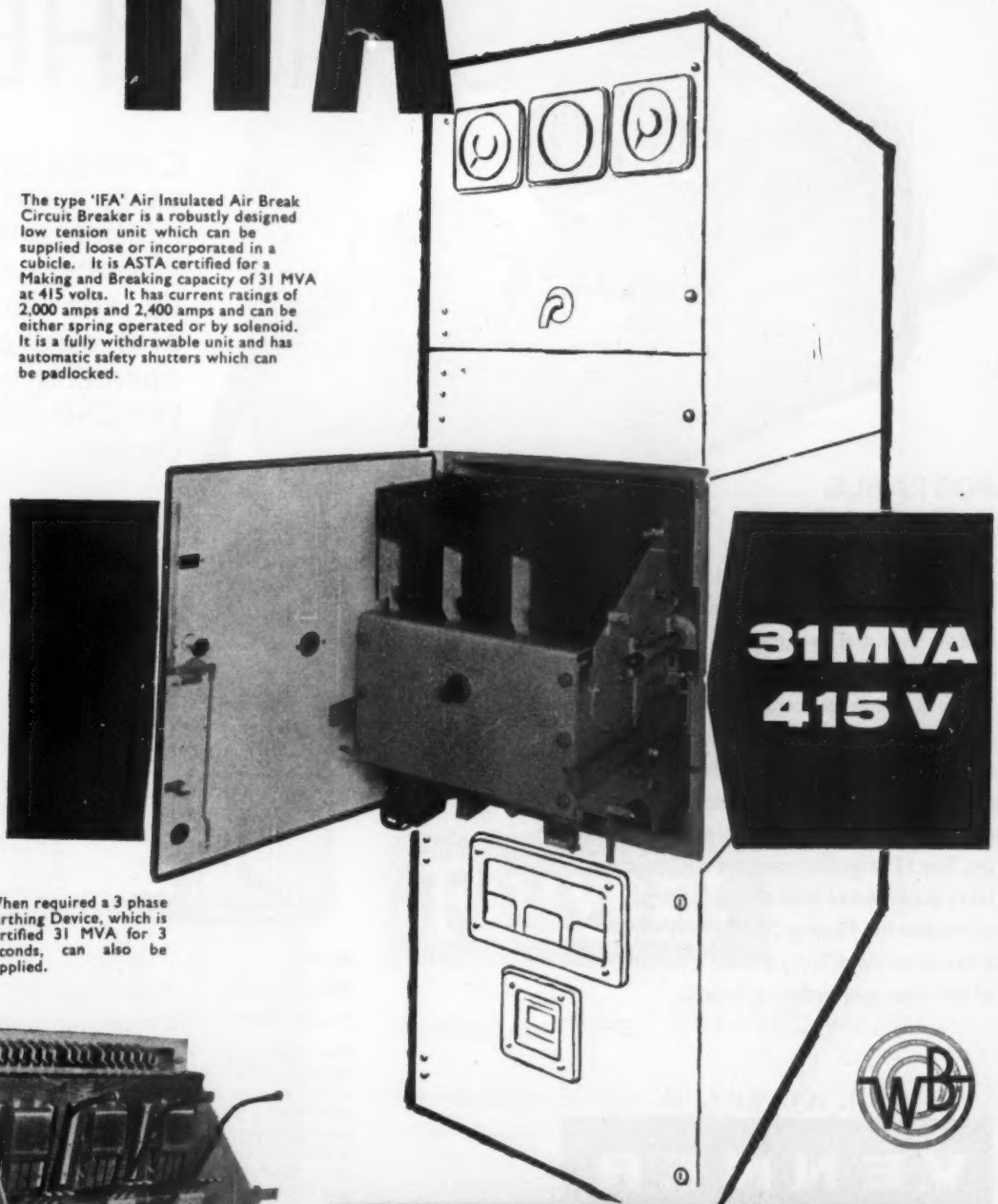
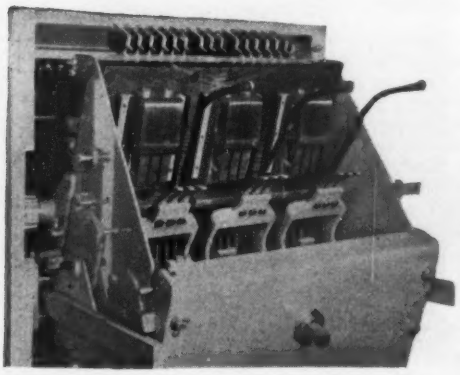


31 MVA 415 V

When required a 3 phase Earthing Device, which is certified 31 MVA for 3 seconds, can also be supplied.



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One toggle switch controls the boiler, the second the circulating pump and the third may be used for a fan for air circulation.

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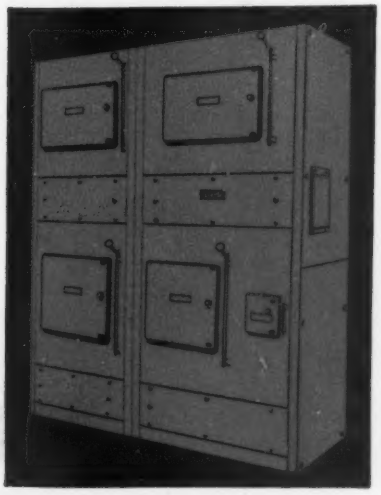

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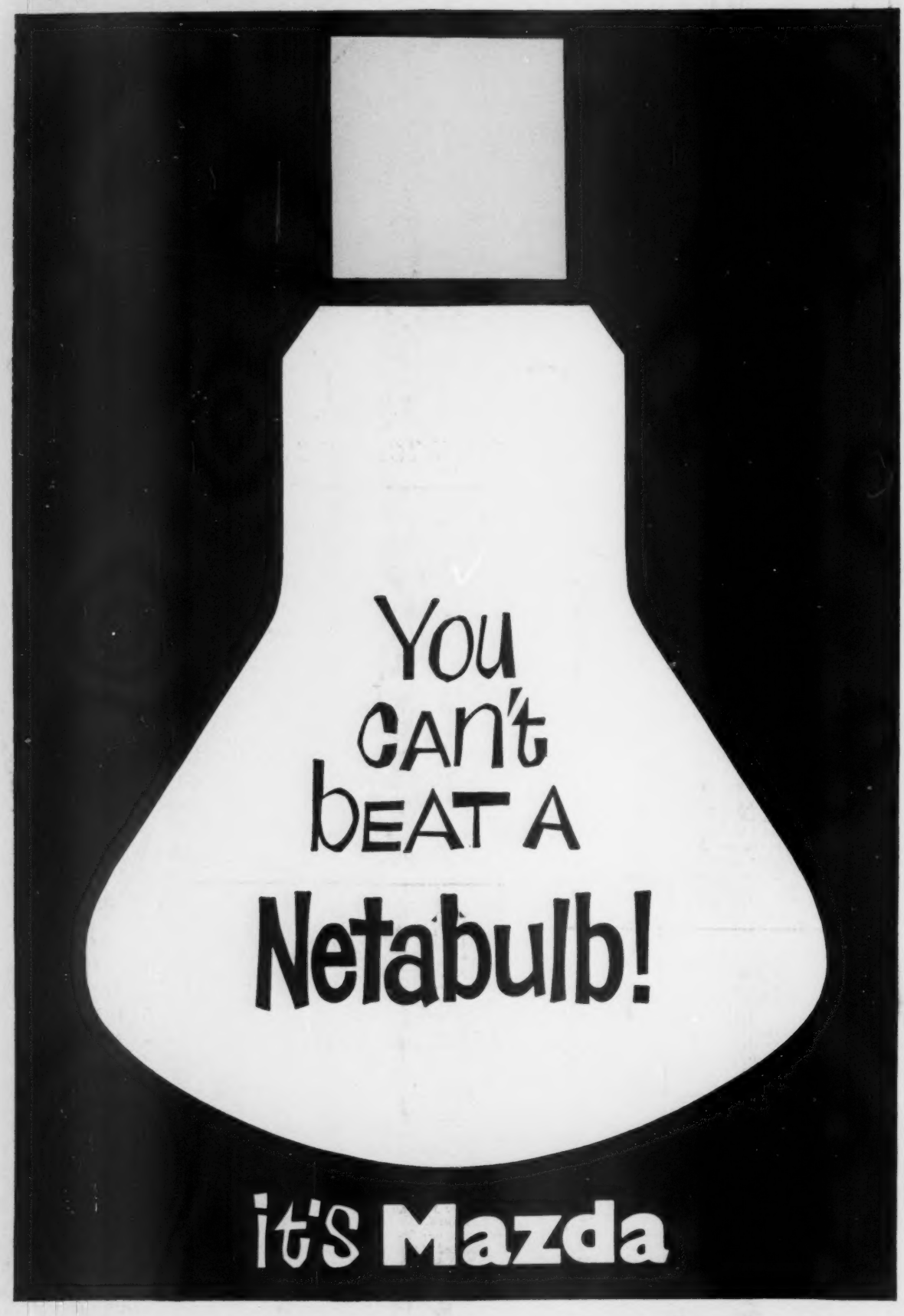
You
can't
beat a
Netabulb!
it's Mazda